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The Canadian
Medical Association Journal

Vol. X. TORONTO, JULY, 1920 No. 7

FOCAL INFECTION

By Charles K. P. Henry, F.A.C.S.

Surgeon to the Out-patient Department, Montreal General Hospital

IT is accepted that local foci of infection, often small in extent, insignificant in appearance, and often without local symptoms, are the unsuspected causes of obscure symptoms of systemic disease, and may even lead to remote lesions which are frequently fatal.

However, this dictum is not as yet too widely accepted to make it unnecessary to emphasize its importance and to record some cases which show features, some of which are commonly treated as separate diseases, and some of which are so remote as not to be commonly recognized as due to focal infection at all.

Frank Billings and his associates in 1914 and 1915 carried out clinical observations, bacteriological studies and animal experiments so clearly and conclusively that there can be no doubt on certain phases of the subject of focal infection.

Local foci of bacterial infection, usually or almost always in tissues communicating with mucous surfaces, commonly give rise to embolic metastases, toxæmia, or septicæmia, or all three. The bacteria obtained from the local foci are identical with the bacteria obtained in the secondary lesions and, as Rosenow has conclusively shown, cultures taken from the local foci, when injected intravenously into animals, will produce in them in corresponding organs lesions identical with those which occurred in the human patient. From these lesions in the animal the organism may again be recovered.

So important was the subject of oral sepsis deemed by the

Read before the Montreal Medico-Chirurgical Society, April 23rd, 1920.

American Medical Association that a symposium on it was held in June, 1914, at the Atlantic City meeting, and the literature, medical, surgical and dental, since then is replete with papers and discussion. During the last few years many cases of oral sepsis with general symptoms of disease have occurred in the practice of all of us, but some of us have, I fear, missed the significance of the local infection in many of them. The illustrative cases recorded in this paper are entirely from my files of private patients.

Primary foci are most often found in the head; in the teeth, the tonsils or adenoids, or the accessory nasal sinuses, the ear, the mastoid, but they occur frequently enough in other places as in cases of ingrowing toe nails, of bronchiectasis, in the gall bladder, the appendix, ulcers in the alimentary tract and in the genito-urinary system. Of all the sites the teeth and tonsils furnish the most numerous cases, and the teeth are the most dangerous.

In lecturing clinically this year to the McGill dental students on oral surgery, I have been surprised at the number of cases coming to my Outdoor Surgical Clinic at the Montreal General Hospital, where the condition for which the patient has applied for treatment was due to oral sepsis. This has been by extension through contiguous tissues, by the lymph channels, or by the vascular route.

The Tonsil as a Focus of Infection

The tonsils are the scavengers of the mouth and the infected food and drink taken into the mouth, and the pus, bacteria, and toxines from local mouth disease drain into these organs. From infected tonsils we often get remote arthritis, secondary adenitis, septicæmia, endocarditis, bone abscesses and secondary anæmia. The tonsils showing the largest amount of infected material are often small, atrophic, with smooth red surfaces, and yet contain virulent pus, with the streptococcus hæmolyticus or viridans as pure cultures therein. So innocent do they appear on examination that often they are dismissed as unlikely to cause trouble.

Case No. 547. C. H., male, age forty-one years, had yearly or semi-yearly attacks of bilateral follicular tonsillitis between the ages of eighteen and twenty-two years, with high temperature and prostration. The last such attack occurred in 1902. Thereafter he frequently had a mild sore throat, with enlarged slightly tender tonsils, slight headache and nausea, becoming more frequent in 1918 and 1919. In the latter two years, often without sore throat, he would have unexplainable headache, with nausea and prostration

and dizziness, and often noticed as these symptoms passed off he would have a peculiar sweet taste in his mouth. During the latter part of 1919 he lost a few pounds in weight, he was easily tired, had less colour than usual and generally was below par. On December 26th he showed a secondary anæmia, red cells 3,410,000, white cells 7,200, hæmoglobin 67 per cent. Two days later he had subacute bilateral tonsillitis, without temperature, but with enlarged glands and swollen tonsils with cheesy exudate. His tonsils were treated by fulgurization on December 30th by Dr. Craig, and up to the present he has been free from symptoms and has regained his weight and vigour; and a blood count on March 12th showed red cells 3,740,000, white cells 6,200, hæmoglobin 84 per cent., a gain of 17 per cent. hæmoglobin.

Case No. 1271. This case illustrates the fact that tonsils, even late in life, may cause remote lesions. Mrs. McN., age fifty-four years, consulted me in March, 1916, with pain in the lower portion of her right leg and ankle, associated with a fallen arch which was considered the cause of her symptoms. Arch supports were ordered and gave some relief. In September of the same year the trouble increased, and on examination it was noted her right tonsil was bright red, enlarged and fixed to the faucial pillars, and there was an enlarged gland at the angle of the right mandible. The patient disclaimed any present or recent sore throat. There was no fever. On October 26th she had more pain than usual in the region of her right ankle, the above gland was hard, enlarged and fixed, and she showed fever of 102°. On November 3rd operation was carried out—up till then refused—the tonsils excised, the gland removed, and the tonsils and the gland both showed pus. She was discharged from the hospital November 15th, afrebrile, but with considerable swelling about the left ankle. On December 20th *x*-rays showed a definite bone abscess in the lower end of the tibia, and in the interval several sinuses had formed in the lower leg which drained from the abcesses. This case showed a primary focus in the tonsil, secondary suppurative cervical adenitis and metastitic bone abscess. The sinuses have healed long since and no bone operation was advised, as the areas were small, and the primary focus was cured.

Arthritis, both acute and chronic, mono- or polyarthritis, is often due to tonsillar infection. The orthopædic surgeon meets many cases where focal tonsillar infection is the ætiological cause. Many cases of pain in the ankles and feet are diagnosed as flat foot, and often the operation of tonsillectomy relieves the patient more than metal arches. Occasionally gout, affecting the great toe or

the joints of the tarsus, which fails to improve under cholchicum, may recede under the same treatment.

Case No. 1803. Miss D., age fifty-seven years, was treated off and on from May till November, 1919, for what was apparently gout affecting her right great toe and the tarsal joints. Later she showed involvement of other joints. Her articular trouble followed acute tonsillitis in April, 1919, and she gave a history of former attacks. She finally consented in November, 1919, to have tonsillectomy done by Dr. H. D. Hamilton. Immediately her joints began to improve and up to April, 1920, she had no further joint affections. Both tonsils contained pus.

The systemic infection does not as a rule occur at the time of acute tonsillitis, but usually some time after the acute symptoms have subsided, usually ten days to a month. I have several times been struck by the sudden onset of acute appendicitis, usually of the acute gangrenous type (embolic) in patients convalescent from acute tonsillitis. The following was such a case.

Case No. 2143. F. W., male, age thirty-eight years, referred to me by the late Dr. Morrow on November 11th, 1919, with acute gangrenous appendicitis with general peritonitis. Onset of attack was sudden, pain was severe and radiated to the tip of the penis, and his abdomen was rigid. At operation his abdomen was full of sero-pus. He had had an attack of acute tonsillitis within two weeks and was only just convalescent therefrom.

The appendix and tonsil both contain lymphoid tissue, and animals injected with bacteria—streptococci—from a diseased human appendix, following tonsillar infection, developed in twenty-four hours acute appendicitis (Rosenow). The sequence of tonsillitis and cholecystitis is equally frequent and bacterial studies and animal experiments have demonstrated the relationship of cause and effect.

As we know that the lymphatics of the mouth and jaws and the surface drainage of the mouth both tend to infect tonsils, it must be clearly shown that the tonsils are the primary foci before their removal is requested. It may be stated that if, following the *complete* removal of a local focus of infection there is not an improvement in the systemic symptoms, either this focus was not the ætiological one concerned or else was secondary to other foci. In the mouth, the teeth and the accessory cavities must be explored before giving the tonsils a bad name. After the correction of dental defects many tonsils regain their physiological function and become a dam instead of a sieve for bateria.

Focal areas of infection may exist for a long time till exposure to cold, overwork, physical or mental strain lower the habitual resistance to the ever present toxin and a flare-up with systemic disease occurs.

The Teeth as Foci of Infection

Leenwenhoek, of Delft, Holland, a lens grinder, perfected a lens through which he discovered bacteria and saw motility. In 1683 he discovered in the *tartar scraped from between the teeth* a form of micro-organism, a contribution on which (with excellent descriptions and illustrations) was by him presented to the Royal Society of London on September 14th, 1683.

In 1762 Marcus Antonius Plenciz, of Vienna, confirmed the above and attributed to them the cause of infectious diseases; he claimed they were *living* substances and that each disease had its own germ as each cereal could produce but one kind of grain.

It was well on to 1860 before bacteria were recognized as likely to cause systemic disease, and not till 1881 did Koch conclusively establish their ætiology factor in disease.

Wonderful, therefore, and far in advance of the times, is the following case report taken from Dr. Benjamin Rush's "Medical Inquiries and Observations," entitled "An Account of the Cure of Several Diseases by the Extraction of Decayed Teeth". "Some time in the month of October, 1801, I attended Miss A. C., with a rheumatism in her hip joint, which yielded for a while to the several remedies for that disease. In the month of November it returned, accompanied with a severe toothache. Suspecting that the rheumatic affection was excited by the pain in her tooth, which was decayed, I directed it to be extracted. The rheumatism immediately left her hip and she recovered in a few days. I cannot help thinking that our success in the treatment of all chronic diseases would be very much promoted by directing our inquiries into the state of the teeth in sick people, and by advising their extraction in every case in which they are decayed. *It is not necessary that they should be attended with pain,* in order to produce diseases, for splinters, tumors, and other irritants before mentioned often bring on disease and death, when they give no pain and are unsuspected as causes of them."

The bacteria flora of the mouth we now know is abundant, and the streptococcus, pneumococcus, endamœba, the fusiform bacillus, the diphtheroid organisms, etc., are all concerned at times in the production of systemic disease.

It is too big a subject to discuss all the possibilities of disease subsequent to dental and peridental infection, but certain statements may be made and accepted.

Dental focal infections are very common, more so now than years ago, and because of the progress of dental science. This paradox is explained by the increase in so-called conservative dentistry. Aching, decayed, dead or infected teeth were formerly extracted. During the last twenty years, especially in city dwellers, these teeth are preserved (?) to the patient by treatment filling the root canals and covering them up with gold crowns. "Uneasy lies the tooth that wears a crown."

The most dangerous varieties of dental sepsis are pulpless teeth and blind abscesses. Such infection must necessarily be carried into the circulation, vascular or lymphatic. The constant biting on such teeth acts as a kind of pump and the abscess at the root is regularly pumped thrice daily at least into the system. Their frequency is beyond dispute. At the Forsythe Dental Infirmary 40,000 abscessed teeth were found in 50,000 children examined. Langstroth found at the University of California Hospital sources of chronic infection in 84 per cent. of ulcer cases, in 66 per cent. of subacute arthritis, in 73 per cent. of chronic arthritis, and in 100 per cent. of gall-bladder cases. Thoma in his chronic medical cases found alveolar abscesses in 88 per cent.

Granted the possibility of dental sepsis, the examination must be complete and thorough. *X*-rays of all doubtful or suspected teeth is good, *x*-rays of all the teeth is better. It has been established that embolic infection of the root tips of previously healthy teeth may occur as well as infection of these by extension from neighbouring diseased teeth. The remote lesions and diseases that are secondary to such dental foci are numerous and widespread and embrace almost all organs susceptible to the results of focal infection anywhere in the body. I intend only to quote one or two examples from my own cases.

Phlebitis

Phlebitis is, of course, an infective, metastatic condition. The focus of infection can at times never be established. In others the apparent focus is dental infection, and its removal cures the phlebitis, or at least prevents recurrent attacks.

Case No. 787. A. R. G., male, age about forty-five years, first consulted me in 1913 for arthritis of his left hip. This he had had for many years, at one time it was considered to be tuberculous.

In April, 1914, he had neuritis of the right external popliteal nerve. In September, 1917, he developed a very acute phlebitis of the left external saphenous vein and was in the Montreal General Hospital. He had a pulmonary embolism there from which he recovered. Later he showed definite symptoms of myocarditis and was a long time getting well. His teeth showed a bad condition of many of them with pyorrhœa, and *x*-rays showed defects in near y all teeth with areas of rarefaction. In November he had eight teeth extracted under a local anæsthetic which was followed by a chill and a rise of temperature to 101° with rapid heart action and præcordial distress. His pulse was again intermittent and rapid. Each time more teeth were extracted a similar reaction occurred.

Such acute reaction is seen at times where the surgeon opens up areas of chronically diseased bone, where prior to operation no temperature or generalized symptoms existed. Such flare-ups may even prove fatal and where many teeth are to be extracted only a few should be attempted at the first sitting. Billings reports a fatal case in a girl of eighteen years who developed streptococcus bacteræmia with acute hæmorrhagic myositis, pleuritis, pericarditis, myocarditis and death following extraction of many teeth with curetting of the alveolar abscesses.

Case No. 1716. M. R., male, at fifty-two years of age developed a severe phlebitis in the veins of the left leg and thigh in November, 1917. He had an exceedingly foul mouth with pus exuding at several places and the foci of infection were self-evident. He was referred for dental treatment and has had no further phlebitis.

Case No. 1309. E. S., a female, age thirty-two years, in April, 1916, reported that during the last two years she had had many attacks of "indigestion", often with nausea, vomiting and dizziness. In May, 1918, she had two attacks of dizziness, faintness and vomiting, and in July and October had several more. On several occasions she was prostrated and had to go home from her office in a cab. General examination revealed no evidence of cholecystitis, gastric ulcer or appendicitis. *X*-rays of the stomach were negative in November, 1918. These attacks recurred at intervals and in April, 1919, she was so ill that a most careful general examination was made. Her fear of these apparently causeless, sudden disabling attacks of intense vertigo, nausea and vomiting was interfering with her work. The teeth showed soft gums at edges of several gold crowns and there were thickened areas of gum infiltration in places. *X*-rays May, 1919, showed one root embedded

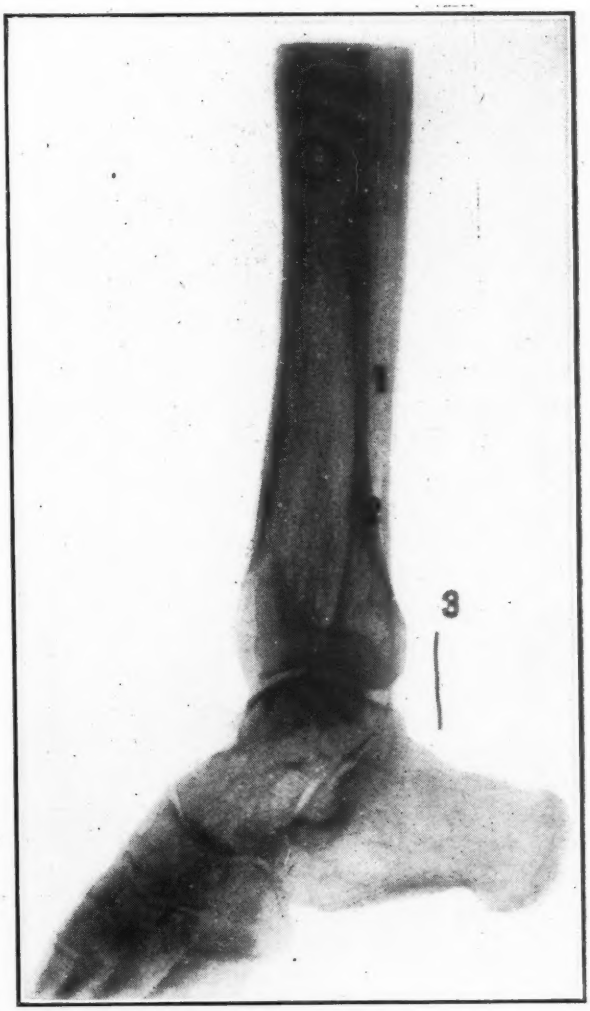
and covered by smooth gum under some bridge-work and rarefaction at several places. The permanent bridge-work was removed, the diseased teeth extracted, and all her teeth cared for carefully. She has not had any of the above attacks since. They were undoubtedly due to absorption from these peri-dental foci.

Several patients have exhibited the common arthritic symptoms, some in severe degree and rendering them in one case at least a chair-ridden invalid. This was a physician's wife, seen in Murray Bay years ago, when a peri-dental abscess due to the streptococcus veridans led to a most virulent condition of polyarthritis and in spite of vaccines and all remedial measures she had lost the use of her lower limbs, and had partial fixation of almost all her joints.

Severe headache, as in Case No. 1610, a female aged thirty-seven years, was due to dental infection and resisted all treatment till the teeth were extracted. One other patient, Case No. 32, a female aged thirty-nine years, developed secondary anæmia and a myocarditis, from which she is still confined to one flat, though her apparent dental trouble ceased with the extraction of three teeth early in 1919.

Hodgkin's disease is a fatal malady and there are many observers who believe it is caused by a definite diphtheroid organism, found in the lymph nodes, in the blood and in focal lesions of the mouth in patients who have Hodgkin's disease. The diphtheroid organisms found in the mouth may cause other distant lesions as well.

Case No. 1214. A male, age about forty years, consulted me October 9th, 1919, for an acute right-sided epididymitis, not of urethral origin. The onset of it was preceded for a week or so by an increase in amount of the pus expressed from along side one of his lower molar teeth on the right side. At that time his cervical glands were enlarged and tender. In the spring of 1919 he was sent by me to his dentist because of obvious dental trouble. He had several teeth extracted, had the emetine treatment for pyorrhœa, and gained eight or ten pounds during the summer. The swelling of the epididymis increased in spite of rest in bed and the application of an ice-bag locally. He had a temperature of 102°. He was admitted to the Montreal General Hospital and the abscess was evacuated under gas anæsthesia October 15th. Dr. Rhea reported "B-19-819 cultures from purulent material from epididymis brought to laboratory by Dr. Henry on October 15th, 1919. Cultures made at once on dextrose agar and hydrocele dextrose agar. From each media a good growth of bacterium in pure culture. This organism



Case No. 1271. Bone abscesses in lower end of fibia, metastatic from tonsil.

Case No. 1271. Bone abscesses in lower end of fibia, metastatic from tonsil.

has been cultured on various media and conforms to the diphtheroid group."

The following day his teeth were *x*-rayed and a large abscess was seen about the left lower last remaining molar, and various other teeth, five in number, were seriously involved. These were removed two days later, and cultures were taken from some of the roots and from the socket of the above molar. The bacteriological report was "S-19-837, swab from tooth October 18th, 1919. Cultures as above were made from tooth but no diphtheroid were recovered. This organism was, however, seen in the direct smear." He was treated with autogenous vaccine and quickly improved and gained nearly twenty pounds. Examination on several occasions physically and bacteriologically showed no evidence of gonorrhœa.

Septicæmia is always a grave condition and in the absence of a local focus our treatment must be empirical, even if we can obtain a blood culture. The search for the local focus of infection must be thorough and all possible sites must be explored. As an example of a difficult localization the following case is quoted.

Case No. 2036. R. S., a male, age twenty-eight years, a heavy robust machinist, was seen February 9th, 1919, in consultation with Dr. Ashton Kerr. He had been having chills, rigor and a rise of temperature to 102° or over, beginning February 7th, though he had been taken ill with what was considered to be influenza on February 3rd. He was quite well in the mornings, normal temperature, and about one hour later each afternoon, he would have a rigor with intense vomiting, became even delirious and his temperature by axilla reached 107°. He was admitted to the Montreal General Hospital next day, and physical examination revealed nothing but a right-sided inguinal hernia, adherent sac, containing a hard mass, reducible and painless. Leucocyte count was 14,000, urine was negative. The spleen was enlarged. Conjunctivæ were of a subichteroid hue. He was put on urotropin though no pus cells were found in the urine. On February 11th a blood culture gave a pure growth of streptococci. His chill on February 10th was most severe, his temperature rising, from 4.40 p.m. to 9.40 p.m., from 99° to 106° by axilla, and he showed three distinct phases, chill, heat and free perspiration later. The search for malarial parasites was frequently negative. The focus of infection could not be found. He had no pain or tenderness anywhere. Rectal examination was unsatisfactory as his sphincter was very tight. During the early morning of February 12th there was a sudden profuse discharge of bloody pus per urethram, and smears showed strepto-

cocci and cultures gave a pure growth of streptococcus. He was given intravenous injections of anti-streptococcus serum for several days, and bladder lavages of permanganate of potash. He had no further chills and recovered and was discharged from hospital February 25th, fifteen days after admission. Careful examination revealed two large calibre urethral strictures, the results of a specific urethritis six or seven years before. Massage of the prostate gave no tenderness, and no external examination could make out the site of the peri-urethral abscess or prostatic abscess which was undoubtedly present and the source of the septicæmia.

Case No. 983. A. L., a male, age nineteen years, walked into my office one day with what was apparently an acute gonorrhœal urethritis. He, however, denied exposure and I believed him. He looked very ill and had a temperature of 101°. The pus was not like gonorrhœal pus and no gonococci were found. He was confined to bed for weeks with an acute pyelo-nephritis, due to the pneumococcus, and his urethral discharge was only a local evidence of a distant lesion where the focal infection existed. Of course this in turn was secondary to the entrance of the organism elsewhere, probably by way of the mouth.

Of the various conditions of systemic disease due to focal infection in the genito-urinary tract besides the above many cases have been met with. In hospital in April, I had a patient, Case No. 1532, a girl of twenty-six years, whose weight had dropped to sixty-seven pounds and whose blood examination showed a cell count of 3,130,000 and only 39 per cent. hæmoglobin. Her focus of infection was that of chronic salphingitis. The examples of systemic disease, septicæmia, anæmia and distant lesions, phlebitis, etc., due to a pelvic focus of infection are so numerous as to hardly require mention.

Even constipation and anæmia may require a careful examination to find the cause. In Case No. 2184, Mrs. N., age thirty-seven years, complained of, and was treated for, chronic constipation with pain in the left side of the abdomen, for years. My examination, much to the surprise of her medical attendant, revealed a large renal calculus which she had been accumulating for years quite unsuspectedly. This necessitated the removal of her left kidney.

Besides these particular conditions it is established that the constant poisoning from dental sepsis may frequently cause conditions of hypertension. The association of a rise in blood pressure with increase in the local inflammation in mouth infections is noted by various observers.

In pregnant females there is an extra demand on the mother for lime salts by the fœtus, whose bones require calcium in large amounts. (Calcium salts form 66 per cent. to 67 per cent. of bone.) In these women the presence of apical dental abscesses are particularly prone to cause trouble. Talbot has shown in a large series of cases that chronic dental sepsis with acute activity of the pus pockets preceded toxæmic symptoms of the terminal stage of pregnancy. In one case post partum convulsions with breast abscess and pyelitis, two pus pockets about teeth were shown by *x*-ray, though no local tenderness or other local symptoms of dental sepsis were present. The toxæmia of pregnancy pre-supposes a chronic sepsis inhibiting kidney elimination and should call for dental and tonsillar inspection, and treatment if infection is found. Albuminuria is in certain cases cleared up by the removal of sources of dental sepsis.

I have seen acute hæmorrhagic nephritis, recurring attacks, associated with absorption from a local streptococcus infection of bone, the existence of which was only discovered when I examined the patient in consultation.

Case No. 2144, a female, age thirty-eight years, had osteomyelitis of ribs and spine with a slowly forming local abscess from which staphylococci and streptococci were cultured. The same organisms were secured in the urine during an acute flare-up of her nephritis. Even after operation she had one more such attack of hæmaturia with fever, malaise and vomiting, when for two days her bone sinus drainage ceased.

No consideration of focal infection is complete without the examination of the thyroid gland and acute thyroiditis is often due to a local small site of infection. Dental sepsis, tonsillar infection, pelvic thrombosis and appendicitis are occasional sources of acute thyroiditis and acute suppuration in this gland.

The so-called toxic goitre may be a secondary instead of a primary focus. I have at present a young girl under my care with a toxic goitre as definitely determined by the estimation of blood sugar, tests for which were recently carried out in the Montreal General Hospital, Pathological Chemistry Department. She has at present an attack of dementia, though she shows absolutely no symptoms of exophthalmic goitre. The toxic goitre is probably not the sole cause of her dementia but its toxic effect on her metabolism will call for its removal as soon as her mental state will permit.

A recent post mortem at the Montreal General Hospital showed an acute suppurative thyroiditis in a case of septicæmia where the primary focus was in the throat.

The enumeration of unusual conditions with case reports of common general diseases and unusual local findings should be of service in stimulating the practitioner and the consultant to exhaust every possible source of examination before arriving at a diagnosis. You cannot empty a reservoir while water keeps flowing in, nor clear up a septicæmia while a local focus is flooding the circulation.

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According to Brown and Sampson, of the Trudeau Sanatorium, in the early or latent stages of tuberculous colitis the clinical picture contributes little to diagnosis. However, certain *x*-ray shadows taken 6, 18, and 24 hours after a barium meal show definitely the presence of colonic ulceration, though their absence does not exclude it. The *x*-ray picture also shows hypermotility and spasm, or filling defects, and such a picture in a patient with pulmonary tuberculosis should lead to a definite diagnosis of colonic tuberculosis. The condition is far more frequent than has been hitherto taught, and must be excluded in all advanced cases as well as all early cases with abdominal symptoms, before submitting them to radical treatment. No examination of a patient with pulmonary tuberculosis can be considered complete without an *x*-ray study of the intestines.—*American Review of Tuberculosis*, 1920, vol. iii, No. 11.

THE PRESENT DAY TREATMENT OF CLUB FOOT

By W. S. Verrall, M.B.

Surgeon-in-chief, Toronto Orthopædic Hospital

So much has been written and so much spoken about congenital club foot and its treatment that I feel as though I should apologize for bringing this subject before you for your consideration and discussion. There are those who say that the treatment has been standardized, and that really there is nothing more to be said. During the past few years, however, I have been so much impressed with the number of cases of relapsed club foot that have come under my care that I feel there is still something we may learn about club foot. This short paper is not given, however, with the idea of instructing, but with the hope that it may provoke some discussion by which we may all profit.

Pathological Anatomy

I desire to draw your attention to three important points in regard to its pathology.

1. Equinus. By the contractured condition of the calf muscles the heel is held up much higher than normal—an element of deformity which is in relationship of the foot to the leg.

2. Varus. Is a deformity of the foot in itself, and would be observed even though the foot were disarticulated from the leg. It consists of an inward deflection of that portion of the foot in front of the mid tarsal joint. There is a shortening of all the structures—cutaneous, fascial and osseous

The third element is Supination, that is the foot is rotated in its long axis so that the outer border is depressed, and the dorsum of the foot is brought more or less in contact with the ground.

Treatment. When should we begin treatment? It is upon this point that there is such a wide divergence of opinion. There are those who believe that the younger the patient is when the treatment is begun the more satisfactory is the result. Others who maintain that the treatment of club foot should not be under-

taken by the surgeon until the child is from ten to even fifteen months old, and it is in the defence of the latter that I wish to speak. During the first year of the child's life it makes relatively its greatest growth and development, and if during that period of greatest growth and development we are making use of constrictive bandage or any form of splint, there is brought about a measure of blood starvation which lessens the growth and development of a foot which is always behind its fellow in size and development. This retarding of the growth and development corresponds to the length of time under treatment and the nature of the materials used for the correction. We have all seen the result of this too early treatment—children growing up with the legs poorly developed—children badly handicapped for their lives. In advocating the delay in the beginning of active treatment, I do not mean to say that nothing should be done. If the parents or nurse be intelligent they can be taught in a few minutes how to manipulate the foot vigorously and daily, thus bringing about a more flexible foot. If this be faithfully done, and the legs and feet given the proper massage, by the time the child has reached that age when he shows an inclination to walk, the correction of his deformity is a comparatively simple matter. The feet are no longer rigid, and instead of keeping the feet and legs in adhesive plaster, plaster of paris, or some other form of splint for a period which varies from three to six months, the treatment will then be completed in a period varying from six weeks to three months, and the growth and development but little interfered with. The retention of the correction so as to prevent relapse is effected chiefly by the natural walking of the child, and as the child ordinarily does not walk before eighteen to twenty months, there is no real necessity or urgency in having the correction made until the walking of the child can be employed for that purpose.

Presuming then that our patient has reached the age of twelve to fifteen months, and has been cared for in accordance with our instructions, we are ready to begin the active treatment to complete correction of the deformity.

The heel is strongly held up by the contractured muscles, thus bringing the long axis of the foot pretty nearly in a line with the axis of the leg. Thus, when the foot is placed upon a wedge, so that its outer border and outer portion of the dorsum rests on the wedge as a fulcrum, the hand of the surgeon can be so used as to exert a strongly corrective force, tending to straighten the foot at its mid tarsal joint. The plantar fascia may be a definite

hindrance, and if so, may be readily cut subcutaneously, just in front of the inferior tubercle of the os-calcis. Forcing the foot out as far as one can without breaking the skin, plaster of paris should now be used to maintain this position for a period of two to three weeks. If, at this first dressing, the varus has not been sufficiently corrected, subsequent similar treatments may be continued until we have over-corrected the varus deformity.

May I here speak of a mechanical error which is very frequently made, namely, a cutting of the tendo achillis as a first step in the operation. By doing so and bringing the heel down the long axis of the foot is brought to a position at right angles to the axis of the leg, and we are then deprived of the opportunity to exert the corrective force just referred to advantageously. The varus must be fully corrected before proceeding to another stage in the treatment. At each manipulation to correct the varus, correction of the third element of the deformity, namely, Supination, will be effected, so that when this part of the work has been successfully accomplished, the foot itself will be in its normal shape. The only element of the original deformity remaining is the equinus.

Correction of the Equinus

In a small percentage of cases the contracture of the calf muscles is overcome by the manipulation and retentive dressings. Where this does not occur the tendo achillis should be cut subcutaneously, thus overcoming the equinus. Following this, the foot is again placed in plaster of paris dressing and maintained for four or five weeks.

The experience has been mine and I am sure it has been that of many others, that this deformity no matter how corrected, by whom, nor how well corrected, will show a tendency to relapse unless the case be followed up and proper measures be taken to prevent its recurrence. As I intimated earlier in this paper, by postponing active treatment until the child is ready to walk, we can then have properly constructed shoes which are corrective—shoes which are extended and elevated on the outer margin of the sole and heel made for immediate use. I find, too, that very often a club foot condition relapses because it is not protected when the child is off his feet. The weight of bedding alone tends to bring the foot back into its old condition of equinus, and I have made a night-brace which will hold the foot at an angle of say 80 degrees, or in other words, when the child is not walking his foot is main-

tained in a brace at an angle of about 10 degrees above the right angle.

In the treatment of adults, the principles laid down do not materially differ. The time taken usually is a little longer, and in my experience very little more necessity for cutting operations than with the child. Greater force must be employed, and a wrench adapted for this purpose may be used. In regard to the prognosis, function is not usually regained as completely as in the case of a child. Under ten or twelve years of age, however, we look for and usually get very excellent results both in form and function.

Summing up, the salient points in the treatment of congenital club foot are: First—Do not begin active treatment before the child is one year old. Second—Over correct the varus and supination before lengthening or cutting the tendo achillis. Third. Open incisions for cutting or lengthening of the tendons or plantar fascia are unnecessary and ill advised; and Fourth—Proper after treatment is as essential as the correction of the deformity.

Cocke reports a patient with acute tuberculous bronchopneumonia was treated by artificial pneumothorax. Thirty-four days after the first introduction of nitrogen gas and following a coughing fit, spontaneous pneumothorax developed. At first partially, within twelve days the spontaneous pneumothorax had become complete, and purulent fluid developed in the chest. The patient became very septic and gravely ill and on the eighteenth day of the spontaneous pneumothorax a rib resection was done under local anæsthesia. After surgical operation, the patient's relief was spectacular and his fever disappeared within a day or two and has remained normal since. The author discusses the probable causes of spontaneous pneumothorax following artificial pneumothorax, but comes to no conclusion regarding its ætiology.

Cocke, Charles Hartwell. Spontaneous Pneumothorax following Artificial Pneumothorax with Operation and Recovery. *Amer. Review of Tuberculosis*, vol. iii, No. 12.

RECENT STUDIES OF SCOLIOSIS

By A. Mackenzie Forbes

Montreal

BEFORE the Great War the study of scoliosis was of surpassing interest to those surgeons who were paying particular attention to diseases and malformations of bones and joints.

In June, 1911, the writer addressed the Canadian Medical Association on the subject of scoliosis. At that time the attention of the members of that Association was drawn to the fact that there were two kinds of scoliosis—physiological and pathological. It was stated that the latter was simply an exaggeration of the former. Further, the statement was made that physiological scoliosis could be obtained by both rotation and side bending. It was suggested that the position of physiological scoliosis followed equally either of these movements and that physiological scoliosis of a reverse character to a pathological scoliosis already existing, could be made use of to relieve pathological scoliosis. The attention of the Canadian Medical Association was drawn to the fact that the attitude of physiological scoliosis is assumed by every individual almost constantly during the day. It was stated that if the patient bent to one side or turned his trunk physiological scoliosis was produced. Indeed it seemed probable that physiological scoliosis followed, or is co-incident with, almost every movement of the trunk, and in many movements of the extremities.

This statement was simply an elaboration of or went further than the dictum of Feiss who some years before stated that the thorax moves as a whole: that neither rib, vertebræ, muscle or sternum can move, or is moved, by itself—that all take part in that complex motion which is possible in the trunk.

The most important contribution made during this address was a statement which was duly accentuated, namely, in order to get rotation of the dorsal vertebræ in one direction by manipulation of the thorax, rotation of the thorax must be made in the opposite direction. This was considered to be paradoxical and requiring explanation.

In the following year, viz.: 1912, there was published an explanation of this fact in the *New York Medical Journal.* This

publication drew attention not only to Feiss's work on the physiology of the spine and thoracic movements, but to the fact that x-rays showed a similar position of the thoracic walls in both rotation of the thorax and side bending in a similar direction.

This article was followed by a series of other articles each of which drew attention to the physiological observations already mentioned, and each of which advocated the treatment of pathological scoliosis by placing the patient in a position of physiological scoliosis of a reverse character to the pathological scoliosis already existing, but accentuating the fact that the patient must be maintained in this position of physiological scoliosis that the law of Wolff may be fulfilled.

In 1914, just before war was declared by Germany, an address was presented to the American Orthopædic Association on this subject. It was then said that practical experience had proved that because pathological scoliosis was a more advanced process than physiological scoliosis, it was useless to attempt to cure pathological scoliosis by superimposing physiological scoliosis of a reverse order, upon it. It was further stated that: "The earliest productions of physiological scoliosis superimposed, as suggested, on pathological scoliosis, did not show a rapid and complete reduction of the deformed wedge-shaped vertebræ, but, rather, a thorax which, as a whole, has been placed in a position as far removed as possible from that of deformity showing, amongst its component parts, vertebræ wedge-shaped individually and collectively forming an area of pathological scoliosis of a reverse character to the physiological scoliosis now produced." At this address it was claimed that "while the theories as to physiological scoliosis enunciated by the writer were true and could not be denied, their application in the treatment of pathological scoliosis was a failure because the lesser could not be depended upon to cure the greater."

In the summer of 1915 the writer had the pleasure of meeting Dr. Robert B. Osgood in France. Both Dr. Osgood and the writer were engaged in the practice of war surgery in different parts of that country. Dr. Osgood drew the writer's attention to the fact that at the last meeting of the American Orthopædic Association—a meeting held nearly a year after the departure of the First Canadian Expeditionary Force, of which the writer was a member, the Committee of the American Orthopædic Association, appointed to report on the treatment of structural scoliosis, had reported unfavourably on the progress made by patients treated in Boston by the method which had been originated by the writer.

This statement caused no surprise because, as already mentioned, the attention of the members of the American Orthopædic Association had already been drawn in the previous year to the fact that pathological scoliosis could not be cured by superimposing physiological scoliosis of a reverse character upon it. Their attention was drawn to the fact that *something more was necessary.*

If the report of the above mentioned scoliosis committee, appearing in the July, 1915, number of the *Journal of the American Orthopædic Association,* is examined, the following words will be found:

"Of the six cases from thirteen to seventeen years of age which have been treated by the rotation treatment—'they were all in fairly good condition, but in two cases collapse seemed imminent after the jacket had been removed and the patient kept standing for inspection. Not only had over-correction not been secured in any case, but in none was there more diminution of any of the elements of the deformity'. . . . The committee feels justified in considering the results as distinctly discouraging."

The writer cannot help but feel that this committee was justified in feeling discouraged if they were looking for cure or even marked improvement by the application of a physiological principle, as a method of treatment, when such application of this principle had been condemned by its sponsor a year before. While to the writer's mind the value of the observations of this committee was lessened by being a year too late, their report may be considered a valuable contribution to our study of scoliosis, because they draw attention to the fact that while the patients were in fairly good condition after their months of treatment in plaster, which held them in a position of physiological scoliosis of a reverse character to the pathological scoliosis already existing, in two cases collapse seemed imminent after the jacket had been removed and the patient kept standing for inspection. Surely this was significant. Surely the collapse indicated that with the removal of the correcting and supporting jacket the patient had once again fallen into a position of pathological deformity, which position of pathological deformity was, in all probability, accompanied by a malposition of the thoracic and other organs, which malposition prevented the normal function of these organs and thus tended to produce collapse.

Let us note that nothing is recorded of symptoms of collapse being produced by physiological correction, but, rather, collapse was produced on a return to the pathological after months of se-

curity in a position of the greatest physiological correction possible in such cases.

The writer is satisfied that by placing the patient in a position of physiological scoliosis of a character opposite to the pathological scoliosis with which the patient is affected that the patient is being placed in a position which is removed, as far as possible, from his position of deformity, but that something further should be done to change the vertebræ which are organically distorted and which, because of their organic distortion are carried over as an area of pathological scoliosis in the midst of a physiological scoliosis.

In 1913 a series of radiograms was taken which demonstrated the truth of the physiological principles laid down in the articles which have already been published on the subject of the rotation or physiological treatment of scoliosis.

In 1916 one of the anatomists of McGill University, Dr. A. O. Freedman, was able to confirm the evidence gleaned by *x*-rays and otherwise. Dr. Freedman rotated a cadaver in the way suggested in the articles already mentioned and, after freezing it, when in this position, cut transverse sections through the trunk in order to demonstrate the position of rib and vertebræ which followed this rotation. Dr. Freedman's experiment confirms the statements made regarding the relationship between pathological and physiological scoliosis and also the fact that in order to rotate the dorsal vertebræ in one direction the thorax must be rotated in the opposite direction. This is not true of the lumbar vertebræ.

Since Dr. Freedman's investigation radiograms have been taken of a patient who was standing in a position of side-bending towards the right. A similar picture was then taken of the same patient rotated towards the right. These shadow pictures demonstrate a similar condition of the thoracic walls. Side bending and rotation in a similar direction seem to give physiological scoliosis of a similar character. Continuing the experiment, *x*-rays have been taken of the same patient while standing in a position of side bending to the right who had his thorax rotated in an opposite direction, namely, to the left. The shape of the thoracic parieties has been reversed. In spite of the fact that the patient remains in a position of side bending to the right the picture of the thoracic parieties has been reversed by this rotation to the left. Does not this experiment suggest that rotation has a more profound influence than side bending on the thoracic walls?

In the experience of the Children's Memorial Hospital, Mont-

real, nearly all cases of extreme scoliosis can be traced to poliomyelitis.

While there are some that cannot be traced to this affection, it is to be suspected that a great many of these are due to this disease or some other form of paralysis although these cannot, with certainty, be traced to such conditions.

A congenitally wedge-shaped vertebra or congenitally wedge-shaped vertebræ have been pointed out in some of the English clinics to be a causative factor for extreme cases of scoliosis. With such deformed vertebræ there may be an absence of one or perhaps even more ribs on one side. Was it not Dr. Z. B. Adams, of Boston, who drew our attention to the irregularities of the fifth lumbar and suggested that such congenital irregularities may, in their turn, be the ætiological factor in many cases of scoliosis?

Another observation made in the Children's Hospital and allied institutions in Montreal is that few cases of extreme scoliosis ever live to old age. Such patients go through life suffering under great disadvantage. Their thoraces are deformed. It is true that, while the capacity of the thorax itself may not be decreased, the thoracic organs are placed under great disadvantage by malpositions, thus greatly increasing the work of the right side of the heart. In the experience of our institutions, patients suffering such deformities very frequently die from acute dilatation of the right side of the heart. Surely these facts impress upon us the necessity for a careful study of all possible remedial agents to allay, if not to cure, this progressing deformity.

In spite of the discouraging report made in 1915 by the Committee of the American Orthopædic Association elected to study the progress made in the treatment of scoliosis, the views of the writer on the subject of this condition have not changed since that society was last addressed by him.

No hard and fast rules can be made for the treatment of scoliosis. It is perfectly true that many patients who are suffering from mild and easily reducible forms of deformity can be corrected or improved by exercises, especially exercises calculated to produce physiological scoliosis of a reverse character to that already existing. Further, many of these patients do better with the support of an easily removable jacket.

It cannot be denied that there are patients afflicted with scoliosis of such degree that no form of treatment yet devised can be depended upon to relieve their deformities. In many of these, the ribs and vertebræ are definitely deformed. These with the

soft parts show organic changes. For these, treatment by rotation to secure a physiological scoliosis the reverse of the pathological scoliosis from which they are suffering, as already suggested, can be considered only as a preliminary part of further treatment.

The writer *has not ceased to think that operative procedures alone* can be depended upon to relieve certain cases of scoliosis and especially scoliosis accompanied by marked structural change. He does not believe that the assumption of a position of physiological scoliosis of a reverse character to a pathological scoliosis already existing, or any amount of pressure and counter pressure, can be expected to permanently relieve a marked structural deformity, especially if this deformity was originally due to certain definite causes amongst which are paralyses and congenital deformities of the spinal column.

The writer still feels that if there are marked bony changes pressure and counter pressure will be insufficient and that treatment will probably be found in the realms of operative surgery.

At the Children's Memorial Hospital in Montreal we have learned to feel that in all cases a certain amount of deformity must be considered as inevitable. We still believe that the introduction of physiological scoliosis of a reverse character to a pathological scoliosis already existing will give us the greatest possible correction. We believe that the degree of physiological scoliosis which may be possible can be increased by exercises, stretching and other means, but we have learned that no corrective methods be they those of Abbott, Lovett, Calvé or others, can be expected to rechange vertebræ which are already deformed; vertebræ which may be wedge-shaped; ribs and bones which may be distorted.

All of us know how easy it has been to get a certain degree of correction by rotation, lateralization or any combination of these. All of us have realized how difficult it has been to secure the correction gained. Even if we can secure the correction, which we have so often seen gained by operative procedures, we shall have made a great advance in our methods of treatment.

In the year 1913 the writer reported a case of operation undertaken to allay a progressing scoliosis. The suggestion was made that if we must accept as inevitable a certain degree of deformity, the rational procedure would be the immobilization of the spine in the greatest correction. This was attempted. Since that time Dr. Hibbs, of New York, has been endeavouring to unite the deformed vertebræ of scoliosis to non-deformed vertebræ by operative procedures.

It may be fairly said that in the Children's Memorial Hospital we have succeeded in fusing the vertebræ in a position of physiological scoliosis. This has been proved to the writer's satisfaction, not only by *x*-rays but by the fact that after such fusion operation, the patient's height is permanently increased. Again, it has been proved during the secondary operations which have been essential to complete the primary correction. For these reasons we do not hesitate to recommend that in selected cases the operative treatment of scoliosis should be employed as a method of decided benefit to patients suffering from this condition.

"CONTAGIOUS diseases are now under control in Roumania." Such was the statement issued recently by Dr. Cantacuzene, a Roumanian delegate to the Peace Conference and director of the Bacteriological Institute in Bucharest; but, he adds, that owing to the frightful sufferings the country endured in the war they are ready to break out again at the slightest provocation. Whilst Russia, Ukrainia and other neighbouring countries are being ravaged by disease, Roumania has succeeded in subduing cholera, typhoid and typhus; malaria alone remains a serious menace. Before the war, Roumania had one of the best organized medical services in the world for the prevention of wide spread maladies. The country was divided into a certain number of districts, where hospitals each supervised by a Government doctor, and infirmaries were maintained at the expense of the state, and in which peasants were given elemental medical care free of charge. Vaccination was obligatory. Small-pox, before the war, was practically unknown in Roumania.

But the war changed all this. Germans and Bulgars plundered the medical laboratories, and the number of victims carried off by disease during the frightful months of the Roumanian retreat can never be accurately estimated. Three hundred doctors, or one-sixth of the whole medical corps, succumbed to their heroic exertions. In the end, however, typhus, like cholera, was conquered. Typhoid never put in an appearance, owing to the splendid achievement of the army medical authorities. Every one of the immense number of refugees who fled across the Danube, were met by a military physician and summarily vaccinated. This measure successfully stopped the outbreak of a calamitous outbreak in the crowded regions of Moldavia. The government has established a new ministry of health in order to co-ordinate all the medical precautionary measures, and has put Dr. Cantacuzene at the head of it.

THE WORK OF A PSYCHOPATHIC HOSPITAL

By A. G. Morphy, B.A., M.D.

IN case of somatic disease, the patient is treated for his own sake, with the object of restoring him to health; in case of mental disease, this consideration is overshadowed by those of dependency and behaviour, the former on account of the chronicity of the disorder and the necessity of public support during a prolonged period, the latter because the public must be protected.

Hence the system of herding the insane in asylum in sequestered places where they are out of sight and literally out of mind.

It must be admitted that an apathetic and pessimistic attitude among the profession and the public with regard to mental disease is largely responsible for our present mediæval method of caring for the insane. The outcome is deplorable. The treatment of the obviously insane has remained a secondary consideration in the public mind and even among ourselves, and the questions of prophylaxis against insanity, special study and treatment of early and curable cases, and even care and systematic following-up of cases discharged from asylums as cured or sufficiently improved to warrant their discharge, have been and still are given very little attention or entirely neglected.

But of late years there has arisen a new interest in mental abnormality which has gained impetus principally from two sources: first, the formation of the National Committee for Mental Hygiene in the United States ten years ago, thanks to the work of Mr. Clifford Beers, followed by the organization of the Canadian Committee in 1918; and second, the urgent necessity created by the late war for the study and treatment of psychoses and psychoneuroses.

Binet's work in constructing practical tests for measurement of intelligence has also contributed to arousing interest in mental abnormalities by providing us with a scientific instrument of considerable accuracy.

The new thought, after long and difficult labour, has given birth to the idea of the institution of special hospitals in which all

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degrees and kinds of mental abnormality could be studied from a new point of view, namely: intensive study of the patients for the sake of their disease, protection of society being a secondary although intimately associated consideration; hospitals equipped with the best possible laboratories for examination and research and staffed by qualified laboratory workers; hospitals in which physicians, psychiatrists, psychologists, social and laboratory workers would work together for the common end, the study of mental abnormality from the physical, mental, and social standpoints.

It was apparent that there were numerous cases which were not taken care of by any existing institutions, neither by hospitals for the insane nor general hospitals, namely, cases of insanity in very early stages and often curable, cases of insanity of mild type and not committable, and large numbers of cases of mental abnormality not easily classified under the term "insanity", in which careful observation and investigation for a week or ten days were necessary for diagnosis.

In order to make such a scheme practicable, special legislation was indispensable, and accordingly the Commonwealth of Massachusetts enacted the "Temporary Care Act" as preliminary to the establishment of the Boston Psychopathic Hospital. This Act provides that:

"The manager or superintendent of any hospital for the insane, whether public or private, may, when requested by a physician, by a member of the Board of Health or a police officer, or by an agent of the Institutions Registration Department of the city of Boston, receive and care for in such hospital as a patient, for a period not exceeding ten days, any person who needs immediate care and treatment because of mental derangement other than delirium tremens or drunkenness."

The Temporary Care Act enables the Boston Psychopathic Hospital to carry on its work. Not only are patients brought in through the various organizations mentioned above, but a considerable proportion come in voluntarily. The public know that the same stigma does not attach to a sojourn in a psychopathic as in a state hospital for the insane, and so have less prejudice against it; and no doubt the attitude of the medical staff towards mental abnormality, that is, looking at it rather from a medical than from a legal point of view, begets confidence.

A brief survey of the work done by the Boston Psychopathic during the few years of its existence will enable us to judge whether it has justified its foundation and continuance.

Its capacity is one hundred and ten beds. During the six years ending September 30th, 1918, there were over 11,000 admissions to the wards. Of these, 9,000 were temporary care cases of whom 2,250 were brought in by the police. In this last group of cases, dementia præcox, alcoholic psychoses, and mental deficiency predominate. The number of voluntary admissions is surprising, almost 2,000, an evidence of the confidence of the public in this hospital. An important feature is also the number sent in by the criminal courts for examination pending their trial, seventy-one cases.

Of the total number of cases admitted during these six years, 4,500 were subsequently committed as insane, and 6,500 were returned to the community as not requiring further hospital care or treatment. Of the psychotic cases, 52 per cent. required commitment, and the remainder were discharged. Let us note carefully, then, that an average of six hundred and fourteen cases per year were discharged as insane but not requiring hospital treatment. These figures prove that there are a considerable number of insane persons in the community whose malady is such that they do not require to be sent to hospitals for the insane, and compel us to conclude that there are very numerous cases in which observation during a period of ten days or thereabouts is necessary in order to determine whether they are committable or not.

It is to be most clearly explained that a psychopathic hospital is only in a very limited sense a reception ward for committable cases, at least in the State of Massachusetts, for in that State the state hospitals have their own reception wards into which patients are admitted for observation pending commitment, and it is the policy of the probate courts to commit the obviously insane directly to the state hospitals. Consequently the psychopathic hospital is concerned with the cases whose ultimate disposition is uncertain and needs to be determined, and herein lies one of its principal functions, which no other type of hospital can fulfil.

In order to form an idea of the variety of cases admitted and the relation of the different classes to one another as regards numbers, let us now consider the statistics of admissions for the year 1918. Under the title "Provisional Diagnosis in Temporary Care Cases" we note the following:

Traumatic psychoses	3
Senile psychoses	32
Psychoses with cerebral arterio-sclerosis	54
General paresis	124

Psychoses with cerebral syphilis	23
Psychoses with other brain and nervous diseases	19
Alcoholic psychoses	115
Psychoses with somatic diseases	33
Maniac depressive psychoses	169
Involutionary melancholia	13
Dementia præcox	436
Paranoia and paranoid conditions	44
Epileptic psychoses	30
Psychoneuroses and neuroses	45
Undiagnosed psychoses	112
Not insane	339
No diagnosis (removed second day)	29
Total	1,540

Of the not insane cases, one hundred and eleven were cases of constitutional psychopathic inferiority, eighty-four of mental deficiency, thirty-two of epilepsy, twenty-seven of alcoholism, and the remainder were cases of organic nervous diseases such as are found in the wards of general hospitals.

These records show how far removed a psychopathic hospital is from being merely a receiving ward for a hospital for the insane. The large proportion of psychoses is notable, and yet in the great majority of these cases there was reasonable doubt at the time of admission as to the existence, kind, and degree of psychosis, and the same remark pertains to the non-psychotic cases with regard to the nature of their malady. Those of us who have been in general practice for a number of years can testify as to the difficulty often experienced in making a diagnosis of mental abnormality, in the unmistakably psychotic cases whether the patient is legally committable or not, and in the doubtful cases whether the patient is insane at all and what is the nature or cause of the mental abnormality. As matters stand at present in this province, our means of settling these questions are very limited.

General hospitals do not like to admit patients of this type, and there is no half-way house between the general hospital and the asylum. That is just where the psychopathic hospital comes in. Its function is to take care of cases in which a decision has to be reached as to a patient's destiny. Is he to be sent to an asylum, to a general hospital, to an institution for the feeble-minded or a re-

formatory, or to jail or to a home for the aged, or to a sanatorium for tuberculosis, or to a private sanatorium or nursing home, or to be returned to his friends? In this the psychopathic hospital is unique; it does not replace any other existing institution. Accessibility is a vital factor of its existence. It must of necessity be in the centre of things, not removed to a secluded spot like a hospital for the insane. It is the centre of a co-operative system consisting of general hospitals whose specialists are called in in consultation, of social workers who are in touch with the public through the various social agencies found in a large city, of all the associations connected with the proximity of numerous colleges and hospitals, of its own visiting staff who attend the out-door department, of the laboratory research work being carried on under the commission on mental diseases, and last but by no means least, the police. The conclusion that this accessibility and co-operation work together for the good of the patients and for the advancement of science is so inevitable that it hardly needs to be mentioned. And what place or institution could be better suited to teaching students the rudiments of mental disease? I use the word rudiment advisedly, for it is well known that mental disease takes a very secondary place to physical in our curriculum. The great variety of cases is an advantage. The marked and distinct types of insanity can be seen, the early and incipient cases, and the cases included under the term psychopathic, such as feebleminded, constitutionally inferior, and so on. In addition, this study would be conducted in a hospital devoted to the study of mental disease from a scientific standpoint, with the advantage of the co-operation of neighbouring general hospitals. It would be hard to overestimate the value of such educational opportunities to any university in which students are taught medicine, and it is very much to be regretted that such an institution is lacking in this large city.

The work conducted in the Boston Psychopathic Hospital is a marvel of co-operation. Psychiatry combined with medical examination, laboratory work, social service and psychology, this is the underlying idea. One portion of this dynamic force is useless without the others, and the whole constitutes what might be termed a fighting unit.

The following cases may be of interest, as giving examples of the different types of cases:

J. V., Italian, age twenty, epileptic, deteriorated. Conduct, disorder at home. Says people held him too tight, and he wanted to kill his mother. Mental age, five years, graded irregularly. Insane, dangerous, committable.

S. B., male, age twenty, weak in childhood, never played, introspective, got on fairly at school, but was hindered by poor health. Four years ago became more seclusive. Lately has been apprehensive. Range of ideas is very narrow, is very religious, quite accessible. Says that God talks to him, but has no definite hallucinations. Diagnosis probably dementia simplex. Schizophrenia not pronounced. Says he used to have depressed periods, and is interested in history and biology.

Francisco X., Italian. Some hallucinations and delusions. Says that pains in his stomach are the same as the pains he had from eating poisoned mushrooms, and that there was poison in the bed to cause the pains. Very slight memory defect, oriented. Had lues eight years ago. Pupils are stiff, knee jerks are absent; spinal fluid shows 192 cells. Paresis, tabetic type.

Pearl B., married. First husband killed himself. Patient was a prostitute, spent some time in reformatory, has been married three times. Went with present husband to hospital where her child was, and when doctor refused to discharge child, became very violent, and slapped her husband's face. Police were sent for and brought her to psychopathic hospital. Examination: is not worried over present state of affairs, rather cheerful, attractive in appearance and manner. Psycho-metric ten years. Diagnosis, moron with criminalistic tendencies.

H. B., aged sixty-two, came into hospital dazed and disoriented. Later consciousness became clearer. Oriented for personality, not for time. Memory very defective. Fills in gaps with confabulation. Has dizzy spells, having fallen in the street several times. Alcoholism admitted. Began to deteriorate two years ago. Diagnosis, cerebral arteriosclerosis—Korsakoff?

Jane J. F., aged seventy-four, had slight stroke ten years ago. Walks about all night, half dressed. Says she is fifty-five, that this is the year 1865, and that we have not had a Sunday for two weeks. Is confused, somnolent, disoriented, suggestible. Diagnosis, presbyphrenia, confabulatory type.

Alice B., aged twenty-two, brought in by the police, having been found in a doorway. Says the sun faded away yesterday. Dementia præcox.

Addie L., aged forty-seven, married at twenty-eight. Had nervous breakdown at this time, lasting six weeks, but was cured by marriage. Perfectly happy. Divorced husband; seven years later married again. Second husband used to drink and abuse her. Left him and went to work. Last October had influenza, and got

frightened about stories she heard about it. Got very nervous. Began to have obsessive thoughts, but no marked depression. Had peculiar feeling in head when reading, and spasm of neck muscles. Diagnosis, hysteria or psychasthenia? Suggestibility is in favour of the former, and contraction of neck muscles, or really a tic, is in favour of latter.

Esther B., aged twenty, had meningitis at four years, graduated from high school at nineteen with honours. Has always been delicate, lately has lost much weight, has visceroptosis, pain after meals. Thought of committing suicide. Went out to pond, but as water was very dirty, decided not to do so. Doctor thinks she is rather apathetic about her illness. Diagnosis, natural reaction to depressed condition of health.

James H., aged thirty-one, brought in by the police, charged with annoying a girl by proposing to her, was scattering flowers along the street in honour of the approaching marriage ceremony, had bought ring and marriage license and published intentions, but girl knew nothing about it. Diagnosis, dementia præcox.

The out-door department of the Boston Psychopathic Hospital is a large psychiatric clinic. Social service and psychology are indispensable elements of its functions. Cases are followed up in a systematic method. A large number of the patients are patients discharged from the hospital whom the out-door look after. Numerous patients are sent by various organizations. In fact, it may be said truthfully that a psychopathic hospital, in-door and out-door, is a kind of last resort for socially difficult cases which other societies, hospitals and organizations have found it difficult or impossible to deal with.

A notable feature of the work done by the out-door department is that of investigating the families of syphilitic patients, and persuading them to submit to tests and to treatment when indicated, Much good has been done in the way of treatment, and many valuable data has been gathered with regard to juvenile paresis and tabes and congenital syphilis. This work is prophylactic, as well as curative. It is also pertinent to remark here that patients are attracted to a psychopathic hospital at earlier stages of their malady than those going to hospitals for the insane, and are consequently more curable. This is undoubtedly a field in which a psychopathic hospital with its highly efficient organization can do very valuable work, preventive as well as curative, of which the results may not be apparent for a long time, but may ultimately make a perceptible difference in the number of cases of insanity due to syphilis admitted to hospitals for the insane.

The outdoor department, with its medical, social and psychological services, forms a unit somewhat separate from the hospital as a whole, and it is satisfactory to find by experience that an effective psychiatric clinic may be operated in connection with a general hospital. And there is no reason why such a psychiatric clinic should not do as good work as that connected with a psycopathic hospital, provided it is well organized in all its departments and the workers are qualified and devoted. The problem of the neuroses, the psychoneuroses, the borderline cases, the feebleminded, and the mild and incipient cases of insanity are the special care of a psychiatric clinic.

Summary

Functions are:

1. To admit cases of mental abnormality of any kind for observation and diagnosis.
2. Brief treatment of incipient psychoses.
3. In the Province of Quebec as emergency hospital for committable cases.
4. Intensive study of mental disease.
5. To advise social agencies about difficult cases.
6. Community and individual work through social workers (syphilis, feeblemindedness, delinquency, etc.).
7. Teaching and research.
8. Centre for mental health work and intensive study of social problems.

ADVANCES IN KNOWLEDGE ABOUT THE BLOOD-CELLS DURING THE PAST SIX YEARS

By O. C. Gruner, M.D.

Leeds

THE science of hæmatology may be regarded as having passed the stage in which the object of examining the blood-cells was to discover the presence or absence of rather rare diseases, such as leukæmia and pernicious anæmia and the like. Up to 1913 the study of such cases was regarded as the scope with which the hæmatologist has to deal, for the detection of malarial parasites was in the province of the pure clinical pathologist, and the total white cell-count in infections was an adjunct to the clinician, ranking second or even third or fourth in importance to the general examination of the case.

Relegation of detailed study of cases of "blood-disease" to the pure hæmatologist, and the exclusion of this kind of enquiry from general clinical medicine has had to yield to the needs of practice, and the story of progress in knowledge about the blood-cells is therefore occupied with a consideration of the genesis of wider conceptions regarding the character of the blood as a whole.

As is well realized, serology has advanced by great strides, whereas the study of cytology of blood-cells has been hampered by a cumbersome nomenclature and the constant appearance of hotly-disputed theories. Yet the progress in serology was a necessary precursor of the modern conceptions of the nature and significance of the cellular elements, and we do well when we keep turning over the pages of serology in order to connect up our conceptions about the fluid of the blood with those about the cells. We find certain principles which must hold good equally in each.

1. *The basis of assessment of advance in knowledge about the blood-cells.* If progress in knowledge is to be assessed in terms of the abundance of concrete facts which are elucidated, it is easy to show that there has been an advance in regard to the subject of blood-cells—not so much because of a discovery of new forms as

because of the elucidation of conditions connected with the appearance of certain cytological details. However, there is another way of judging progress, and that is by considering the ideas which rule the enquiries made.

We can trace a few great landmarks in the history of hæmatology and show that each of them has really been the development of some idea. The *first* landmark is associated with the name of Ehrlich. The great service of Ehrlich is often considered to be his classification of leucocytes according to their granules and his observations on pernicious anæmia and specification of a definite diagnostic formula for the last-named disease. It is, however, more helpful to regard his service as consisting in the introduction of the *idea* of using aniline dyes, just as it is more helpful to regard his service to immunology as being not the famous theory, but his *idea* that one single connection must exist by which all heterogeneity of facts could be gathered together.

The *second* landmark consists in the study of leucocytes by the method initiated by Arneth under the *idea* that *all the cells are not of the same age*. The fact that this is usually described as "Arneth's method" has nothing particular to do with the question of priority of conception of the idea. For the purpose of the present paper strict historical details have less place than the elucidation of principles; and the use of an investigator's name is rather for convenience of identification of the particular subject. The *ideas* underlying researches are usually chronologically scattered over various minds at the same time, a fact which enables us to trace progress without special regard to personalities. The later developments of the Arneth system, therefore, still belong to Arneth, even though other workers have actually been engaged upon the work.

The *third* landmark consists in the study of all blood-cells from the point of view of their genesis, and perhaps the name of Peppenheim is well applied to this subject owing to the assiduity with which he worked on this aspect throughout the whole of his career. But the outsider may notice only a succession of reiterated development-schemata emanating from his pen over a number of years, and accompanied by a peculiarly intricate phraseology. The publications since his death have revealed the fact that underlying his enquiries was the *idea* that the blood-cell-genealogies are expressions of a law, or of a number of inter-related laws, whose understanding is necessary to a proper grasp of clinical processes.

This conception removes us from the idea that the study of the blood is directed towards diagnosing a number of blood-diseases

but towards something more fundamental. For this reason it is best to pass over the prevalent idea that the study of the blood is merely an accessory aid to clinical diagnosis. True progress lies in abandoning this idea without abandoning the determination to study the blood much more carefully in every clinical case.

The *fourth* landmark consists in the discovery that blood-examination reveals the state of the blood at the time of collection of the material. This blood-state may be described in terms of familiar pathological processes, or in terms of phases of metabolism.

The *fifth* landmark consists in the idea that changes in the blood are the outcome of various kinds of stimuli, which are now fairly easily definable, and capable of being utilized in practice.

The *sixth* landmark consists in the idea that chemical changes in the body are behind the cytological changes, and the *last* step in our advance towards complete knowledge about the blood-cells is connected with our insight into the relationship between personality and disease. This step brings us into contact with certain problems, which are of equal interest to the workers in every field of medicine, and it may be said that it is only when we arrive at this point that we find ourselves on the threshhold, the very beginning, of True Hæmatology. Instead of the science of the blood-cells being thrashed out, is has hardly been begun.

2. *The normal "count".*—Having mapped out these various landmarks, we can show how concrete observations have contributed to the realization of the various ideas. The very first series of observations concerns the scrutiny of what constitutes a normal blood-count. From time to time, papers have been published which give the details of a differential count taken in successions of "normal" persons. Much work on this was done at Johns Hopkins hospital, and still more work was done during the war by the laboratory workers in the R.A.M.C., C.A.M.C., and the American Medical Services, who sought to explain the frequency of "abnormal" counts in apparently healthy soldiers. The average count proved to be very different from that which was hitherto regarded as consistent with health or as inevitably a sign of disease.

A number of publications occur, scattered through the past ten years or so, showing that the composition of the blood varies in different parts of the same person, and differs in one given part at different times of the same day. The explanation of this has emerged comparatively recently. On the one hand, there is the splanchnic reservoir, and on the other, there is the action of the

skeletal muscles. Perhaps the most important point is, not that these factors change the blood, but that they are capable of so doing within a few minutes' time.

The question of age, of climate, of geographical habitat (the different zones of the earth's globe), of race, of diet (national or individual), have all been carefully considered. But it is more important to realize that all these conditions produce changes in the blood than to tabulate the changes fully because there are overlappings difficult of precise definition. The racial differences are more definite in regard to the serum, although investigations show that the collective size of the red cells varies definitely in black and white races.

The seeker after weapons for clinical diagnosis is at once discouraged by such discoveries, but this is only because the real scope and power of blood-examination has been missed. These details cause no essential difficulty. In fact, they provide more and more proof that in the morphology of the blood we have a very delicate instrument for measuring or becoming cognizant of variations in metabolic states.

The hæmoglobin content in health. Just as total red and white cells counts may change, and the differential count vary from day to day, so the hæmoglobin content is capable of rapid variation. Once realize how many millions of red cells have to be made per hour in health, there ceases to be so much mystery about the onset of rapidly fatal anæmias.

3. *Developments from the Arneth system.* The number of data hitherto employed in studying the blood evidently presents only a small range of possibilities of variation. Research has therefore been driven to a much more minute enquiry than total and differential counts. The inauguration of this principle appears in the Arneth method of counting the neutrophile leucocytes. As is well known, this method consists in counting out the numbers which belong to each of the twenty kinds of neutrophile leucocyte which appears in this system. The basis of classification is the conformation of the neutrophile nucleus passing from reniform through horseshoe-shaped nuclei to those in which there are from two to five completely segmented nuclear masses in each cell. Although there are so many subheadings, in practice five kinds are considered sufficient; that is, sufficient for practical diagnosis: it cannot be sufficient to abandon the minutiæ which have once been discerned. The conception of the classification at once becomes clear when we learn that the first-named varieties are the juvenile forms, while the last-named are the adult or senile forms.

The chief reason for simplifying the method was that the full count takes up too much time, and does not meet the clinician's need for a method which can be carried out on every case (if necessary), and by any student. The more nearly the method meets the purpose of invariably safe-guarding against certain diagnostic mistakes the more creditable does it become. It is to supply both these needs that we have the most recent application of Arneth's method in the estimation of the "index of resistance". Walker (*Journ. Am. Med. Assoc.*, 1919, p. 1453) has devised the formula $T-(P-60)=I.R$, where T is the total number of thousands of white cells per cmm., and P is the neutrophile percentage. A low index means good resistance, and vice versa. Evidently it is first necessary to know that there is an inflammatory lesion present, so that the formula is used to provide a prognosis, but it may also serve to corroborate or dispose of the question whether there is an inflammatory (especially suppurative) lesion present at all.

We have here an instance in which a limited survey may yet prove of use in practice; and as long as the limitations are appreciated, the clinician is not likely to be surprised when the method fails to give accurate guidance in isolated cases. If we wish to avoid these failures we cannot overlook the many details which have been offered for our view by the Arneth system. But we have to be prepared to spend three or four hours on a given case in order to scrutinize the structure of not only neutrophiles, but also of lymphocytes, large mononuclears and other cells, and we then find important subtle evidences of minute changes in the physiological state of the blood.

4. *Relation between composition of blood and the perivascular cells.* We thus pass to a consideration of the fourth landmark, that of working out the metabolic state of the blood. If, in our story, we pass over all the work of Pappenheim, it is only because we use its fruits, and leave the vegetation for those who desire to gaze upon it. If we derive this great principle out of Pappenheim's labours; that the body is permeated by myriads of "hæmo-potential" cells; that is, cells capable of giving rise to the familiar blood-cells, we shall have a clear perspective in our view upon the details which are presently to be spoken of. Along the whole vascular system (notably the capillary portions thereof) is a sheath of "adventitial" cells which pass part of their life in a quiescent condition, but are liable to become active, either by developing or manifesting powers of locomotion or by undergoing multiplication. This happens to an extreme whenever there is an abscess-formation in any part of

the body; pimples, boils, furuncles, arise in this way in visible parts; internal suppurative processes are also associated with such phenomena. The genealogy from the indifferent mesenchymal connective tissue or adventitial cells in all the various directions of development to small round-celled infiltrations of various kinds was thoroughly worked out and all the debatable questions connected therewith adequately discussed by Pappenheim. It is better to consider all the debatable points as closed, and begin with an implicit acceptance of the principles, and see whither they will lead, rather than enter into the whole controversy with its incumbent enquiry into many abstruse technicalities.

It is the composition of the blood which determines what is going to take place in the adventitial layers. We picture a constant stream of substances passing centrifugally through the capillary walls into the surrounding lymphatic network and, ultimately, into the proximity of the proper tissue cells. Whatever noxious substance may occur in the blood, if diffusible, it will pass through to these parts and excite reactions according to the affinities towards it possessed by the adventitial cells. We regard wandering cells as adventitial cells during the locomotor phase and the principle of reaction remains the same whether they move or are fixed. Even the older and more persistently fixed connective-tissue cells, the fibre cells, are potentially able to retrace all the steps and become mobile again. This is what happens in essence every time scar tissues are resolved, whatever be the agent employed for the purpose.

All these changes are accompanied by changes of structure in the nucleus and form of the cells. This is true whether we have in mind the perivascular cells or the intravascular cells, and that is how it is that the circulating cells bear the impress of these phenomena and enable an insight to be arrived at into these more hidden processes.

5. *Blood-cell morphology as an index of the state of the hæmopoietic organs.* The problem is clarified by provisionally searching for evidence about the functional state of (1) the hæmopoietic organs; (2) the endocrine system; (3) the body as a whole.

The blood furnishes evidence of (*a*) degenerative processes; (*b*) regenerative processes in the hæmopoietic organs. We can start our interpretation of the findings by asking, "Is there a change in the myelogenic processes or not?" Then, starting with the preliminary observation that there is really anæmia in a given clinical case, we look to see whether there are juvenile or immature forms

of red cell present in the blood. If so, there is an active plastic form of anæmia; there is regenerative activity; there is an absence of aplasia of the blood-forming tissue. A noxa may act only on the circulating cells, or it may act also on the tissues (to wit, the special blood-forming tissues), and it is of importance to know which kind it is. Obviously a poison which goes no farther than the actual blood-stream is easier to deal with. Our enquiry gives us a definite insight into this; we assess the degree of damage to the blood, and we determine whether the disease goes deeper also, and is demanding more or less desperate reactive exertions from the cytoplastic side of the vascular system.

It was to elucidate this aspect of study, so fully elaborated in Pappenheim's "Grundriss d. hæmatol. Diagnostik", 1911, that he made a division of blood-findings into (*a*) cardinal, and (*b*) elemental. On the red cell side, we have two cardinal symptoms: anæmia and erythrocytosis; on the white cells side, leukæmia and leucocytosis. The elemental symptoms are such as: percentage of hæmoglobin, total red cell count, details in the blood-smear, presence of parasites, etc.

6. *Chemical changes reflected in blood-cell morphology.* However, we need something far greater in scope. The pathology of the blood is something more than an assessment of degeneration or regeneration or of myelotoxicosis. However convenient it is to have this simple view, it assumes that the blood-forming tissues are a discrete factory connected with other vital organs only by contiguity, whereas the truth is that all organs form one united complex, a change in any one being accompanied by a change in every other. Diseases are really "complex"—diseases, even though apparently confined only to one locality.

Further even than this, it is necessary to consider that disease is not the only change that is going on. Changes are continuing in the various tissues, and in the blood, from hour to hour, and we must learn to discriminate physiological from pathological phenomena, and also to see in physiological changes potential pathological processes later on. Deviations of normal metabolism sooner or later become the groundwork of disease, and we can watch them begin and undergo this transformation.

To work out the practical details belonging to this fourth landmark in progress, therefore, we must start with the admission that the cells in the blood-stream do reflect changes in chemical composition. There seems less scepticism when it is stated that the *serum* reveals subtle changes in its reactions according to its

chemical composition; the phenomena of agglutination and hæmolysis and resistance of red cells find easier admission. In the case of the cells we have to scrutinize them very closely before we can see the differences, and even granting these differences, the conception of a cell as a fixed entity is so rooted that observers are unwilling to trust statements that the form and arrangements of cell-granules can have any relation to transient processes.

It would be better to conceive of blood-cells as transient aggregations of chemical substances or foci of aggregation, centering in the nucleus, which, as it were, grasps things with one hand, makes interchanges, and then hands out with the other hand. It can only take what is given, and the things handed out will depend on what is given, and the changes undergone from hand to hand will also depend on the original things taken up. But the cell-body is nothing but substances coming, substances being changed, and substances going. The cell-substance is material in a state of flux.

Consequently, the physical properties of the serum, the gaseous content, the colloidal properties, the mineral constituents and so forth, all have a reflection in the cellular formula and in the cytological details. If we wish to test the reactive power of the red cells and white cells to various reagents in vitro, in order to amplify our information, there is every reason to do so, and yet it can only be done as a result of conviction that all manner of agents do leave their impress on the cellular constituents.

It now becomes clear that every kind of substance we eat, and every substance that is manufactured in the body, is capable of producing visible changes in the structure of the blood. That which might be admitted as possible—the reaction of blood-cell formula to the presence of microbes—has to be admitted for every-day occurrences also. White cells do not need microbes to make them multiply. There is some reason for the differential count having a roughly constant formula. Artificial means can be employed to alter a count, as it were, at will. There is an ebb and flow of blood-cells per cmm. during the day. This ebb and flow is part and parcel of an ebb and flow occurring through the whole being, it is part of a cycle or rhythm. Digestion leucocytosis is not merely a stimulation of the bone marrow by articles of food; it is part of an emotional "complex" which acts simultaneously along the vaso-motor nerves and the gastric mucosa, etc. Such variations will vary in form according to the emotional build of the person.

In this way it is clear that the blood reflects not only the

hæmopoietic processes but also the changes in the endocrine system, which is a sort of glandular appendage to the sympathetic nerve-terminals. Also, it is evident that the body as a whole has something to say to the formula. The blood-count is, to that extent, peculiar to the particular person, capable of being altered according as the person alters his state of mind.

7. *Relation between various stimuli and the blood.* It is easier to specify the changes produced by pathological stimuli than to give a detailed concrete account of the relations between metabolism in general and the blood-cell formula. We can speak of inflammatory reactions or lymphatic reactions, and the manifestations of the various changes met with in the bone-morrow; but it is even better to take up the various groups of stimuli. If we pass from the physiological forms to the more conspicuous pathological stimuli, we find we can group the latter into (1) toxic; (2) toxo-infective; (3) cyto-plastic. The toxo-infective stimuli act upon the blood as hæmolytic, aplastic, cytoparalytic, colliquative, cytotoxic, cytoplastic, hæmotoxic, and other agents. Total cell counts will inform about the plastic processes, scrutiny of individual cells will reveal the presence of other forms of stimulus. We now see a reason for scrutinizing individual cells rather than counting out the neutrophiles, the lymphocytes, the large mononuclears, and so forth. We also see that a certain degree of vulnerability has to be overcome before a cytolitic or colliquative or hæmolytic stimulus can exert that effect. But the resistance is not mysterious, it is merely the outcome of a given chemical composition. Just as all the seeds in a packet will not produce equally good plants, so every red cell does not possess the same degree of insolubility in toxic solutions. Cytoplastic stimuli cannot react until the hæmogenetic cycle has reached the stage at which the particular kind of cell capable of stimulus has emerged upon the scene.

The forms of cell-death give a clue to the kind of toxin at work. When a cell swells up in the act of necrobiosis we know there is a different process at work to where the necrotic process begins in the nucleus and is not associated with enlargement of the cell.

In all, there are some nineteen characters to notice in every leucocyte. These are distributed over all three components: the nucleolus, the nucleus, and the cell-substance. The relative size, the form, and the various components (granules, form of granules, staining-intensity and so forth) are all considered on the lines used

for studying the details of any cell*. We do not say particularly that if such and such a character is present there is such and such an infection, although within limits such statements are possible. But we remember that every blood-cell stands at some point on a secretory cycle. There is the resting phase and the active phase. No two leucocytes stand at exactly the same level. Pathologically, the details of the cycle may be different; over-activity of secretion will lead to differences of nuclear structure and of contour. Changes in the plasma leave their mark in the form of deviations of nuclear and cytoplasmic structure.

The total red cell count, the hæmoglobin content, the presence of anisocytosis, anisochromia, poikilocytosis, metachromatophilia and the like are all important, but are only the letters of the alphabet, as it were. We must be able to form words, and the words and sentences must yield ideas. They are not fictions, but belong to a real language.

It might be admitted that changes in shape of red cells tell of changes in tonicity of the serum, changes in osmotic pressure, but we need to know much more than that. It is not enough to know that there is an erythrocytotoxin; we want to know what kind of toxin; we want to know what change it is in its lipoid chemistry that accounts for the toxin having been able to act; we want to know the factors which have culminated in that change in chemistry. Therefore, however alike one red cell may look to another, there is a mine of information to be sought for and gained by intelligent observation of the individual and total cells.

Besides these cellular constituents, there is an important series of observations to be made about the granular constituents of the blood. The so-called "platelets" are really a heterogeneous series of entities. Some of them are true platelets, others belong to the hæmokonia, and then there are other still more minute particles, which appear in the forms presented by various cocci and bacilli. Fat granules are visible as minute drops showing Brownian movement in healthy persons after suitable meals, and in cases in which fat digestion is interfered with. It is convenient to group all these various kinds of particles as "suspended matter", and it is important to observe the blood very quickly after collection, because many of the groups of particles undergo rapid disintegration and pass from view. This holds specially for the aggregations occurring

* Biology of Blood-Cells, pp. 21, 133, 174, s19: Guide to the Description of Microscopic tissues. (H. K. Lewis and Sons): opening chapter; Exact Diagnosis of Latent Cancer, (H. K. Lewis and Sons); chapter iv.

in tuberculous blood. The particles dominant in cancerous blood and allied forms of blood are, on the other hand, more conspicuous after the blood has stood for a quarter of an hour or so, although even here it is advisable to watch the precipitation and note the phases of the process rather than leave a time to elapse before making observations. Much information can be gathered by taking the time-factor into consideration.

8. *Relation between blood cell morphology and groups of infections.* When we classify the details of structure of cells along with their relative frequency in a count according to the organisms at work in the appropriate cases, we find that there are a few simple relations between the existence of coccal infections, of bacterial infections, of acid-fast-bacterial infections, and of protozoal infections. In the case of the last named, it is nothing new to refer to the increase of large mononuclear leucocytes, and sometimes of hyaline cells. In the case of the first two, it is also well accepted that neutrophile leucocytosis is to be expected. The work which goes by the name of the Arneth method shows how often in septicæmias and the like there is also a "deviation to the left" in these leucocytoses. But there are confirmatory tests. The ferment-granules in the neutrophiles stain differently, are much more distinct and clean cut and are more numerous in coccal infections. In the acid-fast cases, relative and absolute lymphocytosis is a gross finding of great value. The degree of complexity of outline of the nuclei also varies according to these main groups of infection, and the form of the complexity varies in cases of chronic rheumatism with bone-changes, in severe hæmolytic anæmias and in carcinoma cases with metastases.

As has been already insisted, however, such a procedure is empirical rather than rational. The fundamentals are of greater value, because there can be no mistake whereas a classification according to external causes of disease is sure to fail in a certain number of cases. It is the difference between making our aim one of finding a cure of disease, and making our aim that of demonstrating the location of the various contributory factors, so that the public may avoid them, if they will. The prevention of Bilharziosis by being able to put noticeboards along the canals where bathing was not permissible did more than the attempts to cure those who already suffered, though both procedures demand attention.

9. If we turn for a moment to consider the vexed question of pernicious anæmia and leukæmia, we shall be able to pick up the

point at which the thread of progress was lying. Everyone knows the wonderful scope opened out by Ehrlich's theories about these diseases, and especially the former. Everyone knows how he formed a school in which the pupils slavishly followed every little statement proceeding from the mouth of a great personality. Yet his statements evoked 90 per cent. of the controversial literature, which really only evidenced the eternal conflict between minds disposed for, and minds revolting against, individual authority. We need not concern ourselves with these details. As a matter of fact, two lines of thought did emerge through the work of two enquirers who in their turn refused to be bound by this personality. Hunter pioneered on his own lines, and Pappenheim, working on purely histological lines, founded his own school and proved a personality capable of attracting a school in his turn. But these two seemingly divergent channels are really complementary, although the clinician concluded that the "severest anæmias", though elusive of definition and diagnosis were definite entities, whereas the hæmatologist concluded that there is no specific anæmia; that even in the fatal cases the anæmia is only a symptom; that a hyperchromic anæmia is only a phase of one common process which affects one human being one way, and another another. To quote his actual words: " 'Pernicious anæmia' means merely a well-circumscribed hæmatological symptom-complex, a characteristic blood-picture, not a particular disease; and while its regenerative components may under certain circumstances be specific, its *real* specificity lies in the *degenerative* components (which are compulsory) of a special kind. And this composite effect is dominantly constant in a series of cases." (Grundniss, p. 84.)

In each case, we find that we are at a sort of *impasse*. On the one hand there is the idea of a separate entity of disease, and on the other that whatever the disease be, the blood itself can only show changes with reference to its formative organs. The cells are assigned the position of being the essence of the blood, and there is no place left for the volumetrically dominant fluid. According to prevalent conceptions, substances are poured into the blood, and others are taken out at the excretory organs, and that is all. But the fluid part remains a dominant feature; it is an entity; its proteins are different from any other; it is diseased in pernicious anæmia as much as the cells are or as much as the tissues are in which the blood-cells are manufactured.

This shows where the thread of enquiry must be picked up. Cells and fluids are essential components of equal importance.

Each is studied separately, necessarily, but when the successive data have been made out, they should be linked together again.

In the case of the leukæmias, the line of enquiry has simply brought out greater and greater varieties of manifestation. It is well known that quite 60 per cent. of technical literature about blood is on this disease and its variants during a number of years. It is easy to see why this should have been the case. But it is necessary to give it less importance because it diverts attention from the features needing elucidation in an endless number of clinical states, especially those in which there is as yet no declared disease. Enquiry therefore turns into the directions of the diatheses and dyscrasias, which have been waiting during centuries for the answer provided by all the enquiries of the past half century.

10. *Summary.* It has been shown how the existing knowledge about hæmatology is, in a sense, only a preparatory stage to the true insight into the nature of the blood and its changes under the most varying conditions, and that the science is still only in its childhood. It has been intimated that we search, not so much for disease-entities as for the conditions underlying their appearance. We are able to be guided to those factors which go to make up "latent" disease. Stimuli may operate for days before a declared disease. In some cases it would be possible to predict the incidence of disease years before it actually took place, because when certain substrates are actualized, they can form the matrix of very few defined conditions familiar to medicine.

Then it has been intimated that we can go behind concrete causes and effects, as soon as we realize the personality behind all the organs, whose rhythm accounts for the changes taking place in them in health. Such a conception as this floods our view of tissue-changes with a new light, as we see that all the variety of lesions are the outcome of one dominant factor—not microbic or even constitutional, but beyond both.

A realization of such possibilities brings us back again to the desire to prevent the incidence of disease by spreading among the public clearer knowledge of the factors which gradually converge to the production of disease, either in individuals or in communities.

Finally, it has been suggested, but the conception has not been elaborated, that there is a very close connection between the fluid portion of the blood and the cellular forms. Both are essential parts of one complex, and must be thought of together if we are to grasp the meaning of much that we see under the microscope. In other words, the cytology tells us about the biochemistry, though

the language employed for the latter is different from that which the chemist employs. It is no use being content with the idea that the blood is as it were a galenical mixture into which certain substances are being poured, and certain cells simultaneously introduced in an automatic fashion. By conceiving the blood as a unit, however complex be its constitution, dependent upon the occurrences in the body as a whole besides those in the organs in particular, we find the scope of our enquiries vastly extended. We pass from the conception that the "puncture-fluid" is related to the blood-cells, and vice-versa, to that in which each in turn undergoes regulation and modification by the action of the sympathetic nervous system, and other anatomical complexes. This, and all other parts, are linked together inseparably. Perhaps after that we shall find that we look at our patients in a manner not very different from the supposedly obsolete method used by the great physicians of the ancient world.

In a paper from the Department of Medicine of the Jefferson Medical College, Funk expressed his belief that late syphilis of the lung occurs clinically more often than is generally thought. Diagnosis is difficult and judgement may have to be suspended until lues have been controlled by treatment, when "apical râles" will clear if the signs are due to syphilis. The author reports in detail three cases of what he believes were pulmonary syphilis that have come under his own observation. In arriving at a diagnosis the following points are important: (1) the history; (2) signs of syphilis in other organs; (3) the location of the lesion—syphilis usually involves the hilum areas of the bases, unusually rare locations for primary tuberculosis lesions; (4) the persistent absence of tubercle bacilli when signs of advanced pulmonary disease are evident; (5) a positive Wassermann; (6) certain roentgenographic features; and (7) the response to antisyphilitic treatment.—*Amer. Review of Tuberculosis*, vol. iii, No. 12.

MEDICAL EDUCATION

By J. J. R. Macleod, M.B.

University of Toronto

PROGRESS of knowledge in the medical sciences has become so great that it is impossible in a college course of practicable length to train every student to be familiar with the details of all these sciences. A general acquaintance with them is essential for every student, but beyond this a specialization of study becomes advisable for at least a certain number. In approaching the problem of the training of the medical student it is important, therefore, to consider first of all the nature of the various fields in which the medical graduate may find his life work. We may then proceed to consider the grouping of courses which will most adequately equip each group of students for the particular field towards which they are attracted.

By far the largest proportion of graduates in medicine will find their life work in the field of general practice. The student of this group must be trained to become a family physician; to be competent at all times to investigate the cause of ill-health or suffering in those who seek his aid, and to prescribe the proper treatment for the relief of the abnormal state. In place of specialization in any one particular branch of medical or surgical knowledge, the general practitioner must have a sufficiently comprehensive grasp of the whole field of medicine and surgery, to enable him quickly to diagnose the general nature of disease. If he should find that special knowledge is required for more precise diagnosis or for special treatment, it is his duty to direct the patient to the specialist who can best aid him in this work. To perform these functions properly and conscientiously, the general practitioner must be a man of broad interests, humane and patient, and with a reputation for balanced judgement and for a wide range of general medical and surgical knowledge and skill.

For the application of the newer methods of diagnosis and treatment, it is necessary, however, that the general practitioner be assisted by specialists. These are of various types of which in the

first place we may consider the surgical and medical specialists. These must be trained in the use of precise methods of diagnosis and treatment, involving in many cases great manual dexterity, and they must have a close intimacy with the literature which records the progress in their special fields. To this group belong the specialists in diseases of the eye, ear, nose and throat, the orthopædist, the gynæcologist, as well as specialists in certain types of general diseases, such as tuberculosis and heart disease. It cannot be denied that the acquisition of a high degree of proficiency in one limited field gives to many minds a satisfaction which it is impossible to acquire in general practice. Instead of having to deal, as the practitioner so often must, with obscure general conditions, the specialist deals with selected cases, and is therefore able with greater precision to detect the exact nature of the causative factor and to apply methods of treatment that require a high degree of technical skill. The specialist's duties are therefore much more defined than those of the general practitioner, and it is, I believe, partly on this account that during recent years so many have been attracted from general practice into this field. Admirable though this drift may be, we owe it to our profession to see that it does not occur to such an extent that the value of the general practitioner is underestimated or that his dignified position in the profession is in any way lowered.

A specialist of an entirely different type is the hygienist. His function is not to treat disease in the individual, but to study its prevention in groups of individuals. He must be a man well trained in general science in addition to that of medicine, for he must seek to determine the relationship between the incidence of disease and the physical and other conditions of the environment in which the people live. His duty is to the State rather than to the individual.

In recent years it has come to be realized that the care of the mentally sick should be entrusted not as heretofore to the general practitioner, but to men who, in addition to their ordinary medical training, have made themselves proficient in normal and pathological psychology. It is under the guidance and with the aid of the neuro-pathologist that the State should manage the institutions that are established for the care of the insane, for in this way only can the efficient care and the scientific treatment of these unfortunates be satisfactorily and humanely attended to.

Lastly we have the laboratory specialist devoting himself to the investigation of problems bearing on the more strictly scientific

side of medical practice and to the instruction of students in the various sciences that contribute to that of medicine. The anatomist, the physiologist, the biochemist, the pathologist, and the clinical laboratory expert are among the workers in this field. By their constant and diligent searching for new truths and for improved methods for the investigation of disease, these men constantly contribute a large share towards the progress of medical and surgical knowledge. They have also made for themselves an important place as experts in the solution of economic problems such as food control, industrial fatigue, etc.

It is clear that no general plan of study can adequately equip the student to follow every one of these vocations. At the same time practical considerations make it necessary that there be some basic course which shall adequately prepare all students for the type of work in which the majority of them will find their vocation. This obviously is general practice. The specialties must then be grafted on this general course, and, whenever possible, this should be started at as early as stage as possible, for if the specialist's training be left entirely until he has graduated from the general course, he will be beyond the age at which he can so readily begin to ground himself in the fundamentals of his chosen specialty. Moreover, if the student postpones, until after graduation in medicine, attendance at university courses in which these fundamental sciences are given, he is likely to find the way blocked by various obstacles which it is very difficult, if not impossible, for him to surmount. It is important, therefore, that opportunity be afforded during the general course to make a beginning in the special studies.

Having reviewed in a general way the nature of the problem of medical education, we may now proceed to consider the methods by which its solution is most likely to be attained.

There are certain fundamental principles which must guide us in framing the curriculum. The most important of these are, first, to train the student to think scientifically and secondly, to enable him to acquire a knowledge of essential facts and of the various technical processes that are necessary for the practice of his profession.

These principles have been stated in what I believe to be the order of their importance. For if the mind be properly trained, the acquisition of knowledge will unconsciously follow, and the graduate will enter upon his professional career prepared not merely to apply the already established practice of others, but as a trained

thinker and investigator. Every graduate in medicine, whatever his particular sphere of activity should be an original investigator. If he is engaged in general practice he must consider every one of his patients as furnishing a separate problem to be investigated by the application of scientific methods reinforced by a knowledge of the experiences recorded by others. If he is engaged in any of the other branches of medical science originality in thought is equally essential to success.

It is particularly for these reasons that the broadening of culture by more intensive preliminary training is recognized to be essential in medicine. It is also demanded in the applied sciences. In the case of the engineer, for example, the receptiveness of mind and the maturity of judgement which comes from a greater general education are now agreed to be essential as a preliminary in his training. Now the work of the engineer is with mechanical things. He has to deal with measurable factors, with calculable forces, and with known magnitudes of error But the physician must deal with a much more complicated type of problem, one which embraces elements of vastly differing categories, chemical, physical, biological, and psychological. Surely to do this properly the medical student, before he enters upon his more strictly professional studies, must be at least as highly trained in the sciences as the technical student. And he should besides have a broader education in the humanities, for his science must be tempered by a sympathetic understanding of human nature if he is to apply it successfully in the relief of suffering. He will, moreover, be called upon to assume his professional duties almost immediately after graduation, unassisted and practically unguided by more experienced men. No period of apprenticeship is interposed between his graduation from medical school and his responsibilities in dealing with matters of life and death. It is clear, therefore, that the training of the doctor is more complex and undefinable than that of the technician. The first part of our problem, therefore, is concerned with the preliminary general training of the medical student and with the subsequent integration of this training with the more strictly professional, so that he may go forth into the world adequately prepared both professionally and scholastically.

To attain these ends it is probable that any selection of cultural studies might be employed, but it is important, on account of the many and diverse facts that the student must ultimately become acquainted with, to select them as far as possible from the standpoint of their practical value to the physician.

The attempt has been made to ensure this broader culture by a gradual raising of the requirements for entrance to the medical school, either by demanding longer attendance at the high school, or by one or more years at college Although a few high schools may be in a position to provide suitably advanced courses in the languages and related subjects, they cannot as a rule do this for the subjects upon which medical science depends, viz.: biology, physics, and chemistry. In the High School these subjects must necessarily take a place of secondary importance in the curriculum, and it is usually impossible to offer adequate practical instruction because of lack of laboratory facilities. In the high school these subjects should rather be given not with the object of replacing the college course, but as preliminary to them, for it is clear that a beginning should be made in the premedical sciences as early as possible, so as to introduce to the mind of the student the new principles and the new conceptions which they contain. If the date at which the student first approaches these subjects is left until the college is reached, the instruction in them must be crowded into a few months, which is all too short to make it likely that the fundamentals will be properly grasped.

Recognizing therefore that a certain amount of study in the premedical sciences is most desirable in the last years of high school, it is nevertheless clear that the greatest proportion of the instruction in these subjects should be given at college. They should form the main part of a complete year's instruction in such an institution, for they form the minimum basis for any further study in the medical sciences. But just as it is important that these premedical sciences should have been started in high school, so is it important that during this first year at college certain at least of other subjects of the high school curriculum should be continued with. A sudden break in a course of studies between the high school and the medical school is clearly unsound pedagogically. It means that the student having now no opportunity to proceed further in his high school courses, forgets a large part of what he has already learned and fails to utilize even this amount of knowledge as an aid to his education in medicine. It is essential in medical, as in all other special fields of education to correlate studies of different types so that the student may be trained to utilize to full advantage all the knowledge with which he is familiar.

The application of this general principle to the framing of the medical curriculum, and to the setting of entrance standards for the medical schools has been attempted on somewhat different lines

in different countries, but during recent years it is particularly in the United States that the experiments have been most intensively and conscientiously carried out. A review of the history of medical education in the States is therefore particularly illuminative. Following upon the preceptor or apprentice system for the training of medical practitioners was a period, the dark ages of medical education, during which the prospective medical graduate received his sole instruction by attendance for one or two years at didactic lectures. These lectures, delivered usually to large groups of students, were unadorned by any kind of practical instruction, and they were not even graded so as to show the relationship of the fundamental sciences to the practice of medicine and surgery. They were unauthoritative, haphazard, and practically useless to train the medical student. So utterly disorganized did medical education become under this system that for many years it may truthfully be said that no completely trained physicians or surgeons were graduated from any of the schools in the States. The low bars of entrance, the short duration of the course, the practical absence of examination requirements led to a serious overproduction of medical practitioners, qualified by law, but utterly unqualified by training. These conditions lasted until well into the eighties. It is true that during this period some of the better teachers succeeded in inspiring in some of the students a desire for more through instruction. But this could be found only by a visit to the clinics of Europe.

The deplorable conditions set up in the medical profession by these lax methods of instruction led several men, particularly those who had studied abroad, to realize that improvement could be effected only by a decided reversal of the policy of medical education. And the first dawn of this new era must, I think, be accredited to the institution by Welch in Bellevue Medical College of a laboratory course in pathology. This was followed in 1893 by the establishment of the Johns Hopkins Medical School, requiring for entrance a college degree in arts, or its equivalent, and offering a course which included extensive laboratory instruction. The remarkable success of this experiment in medical education prompted other schools, such as Harvard, and Western Reserve, some years later to adopt virtually the same standard, with the result that after the interval of a few years, other universities such as Cornell, Chicago, and California, introduced at least a certain degree of college training as a preliminary requirement for entrance to their medical schools. For the last decade, therefore, medical education in the States has been undergoing a rapid process of evolution

tending ever to carry it to a higher plane, with results, which, without exaggeration, we may say, have been extraordinarily successful in raising the quality and efficiency of the medical graduates.

It is interesting and highly important for us to analyze the main reasons for this improvement. These are, I believe, first, by securing students for the medical school who were better equipped mentally to assimilate and understand the instruction in the medical courses proper, so that they can profit more from the instruction. Second, by relieving the medical curriculum of courses in certain of the fundamental medical sciences, such as chemistry and physics, so that more time is afforded in which attention can be paid to the development of the many new subjects which marks the great advance in medical science, such as bacteriology, biochemistry, pharmacology, etc. And third, by turning out medical graduates with a greater breadth of vision and with minds better trained to think independently. There can be no doubt that it is in the main because of this elevation of entrance requirements that the graduates of schools like Johns Hopkins, Western Reserve, Harvard, and Cornell, to mention only a few, have shown themselves when compared with graduates of other schools to be of decidedly greater value as medical and surgical experts under the trying conditions met with at the battle front. Those who have been in a position to compare the efficiency of the men thus trained with those who had received an inferior training, have become convinced that the graduate of the former group was better qualified not only to apply the practical knowledge which he had already acquired, but also to adapt himself so as to practice new methods of diagnosis and treatment as the necessity for them arose. Not only was the graduate from the schools better equipped to practise the known facts of medicine and surgery, but he was better prepared to evolve and apply new principles and methods.

Notwithstanding these facts, however, it would be unsound to conclude that every medical student should be compelled to have a college degree in arts before he begins with his medical studies. It must be remembered that to attain this training the graduate must spend in the academic college and in the medical school a period of time, namely seven or eight years over and above four years of high school in the States, which is considered too long to expect of the average medical graduate. A graduate of this class will be at least twenty-six or twenty-seven years of age, and if we add to this the high desirability of his taking a further year's n ternship in a hospital, so that he may acquire confidence in the

practice of his profession, the age of graduation becomes decidedly too high for the majority. The tendency of so long a postponement of the age at which he starts in general practice is to induce the graduate to seek immediately for some means by which, without further expenditure of time, he can acquire sufficient income to establish a home of his own and be independent of financial support from others. He is therefore impelled to assume duties and responsibilities which rob him of time for further study, and surely this is unwise, for it is particularly at this stage in his career that the physician should have ample time to read broadly in his professional subjects so as to be in a position to compare his own experiences in practice with those recorded by others. He is deprived now for the first time of the aid afforded by instructors to guide him in the interpretation of his observations and in the application of methods of treatment, and for this reason he should find a substitute in the free use of libraries. It is a deplorable fact that our medical libraries are not more freely used by those who have recently graduated from medical school, even when they come from one of the type we have just been considering.

And there are other objections to the college degree as an entrance requirement to medical school. One is that from two to four of the seven or eight years devoted to his training are taken up with courses which have no direct bearing on the science of medicine, thus leaving a period of time that is quiet inadequate for an intimate familiarity with its practice.

Another objection is that the college degree accepted for entrance necessarily varies greatly in standard, and particularly so with regard to the instruction to which it certifies in the premedical sciences. The arts degree does not therefore guarantee a reasonable uniformity of academic or of premedical training. In this connection it may further be pointed out that the premedical sciences must be given in the academic colleges from a standpoint which is more general than that which is most useful for medical students, for the requirements of all classes of students have to be considered. The instructors also cannot as a rule appreciate the applications of their sciences to that of medicine.

In consideration of these and other conditions the problem has therefore been solved in the majority of medical colleges by requiring for graduation in medicine six years of combined academic and professional training, over and above the High School. And the question which is at present confronting medical educators concerns the proper apportionment of this time, so that the prin-

ciples to which we have already referred may be applied in the training of the medical graduate

It need scarcely be remarked that the medical faculty alone cannot undertake the whole of this training. It must be assisted by the arts and science faculties. In many of the medical schools of the United States, the college and the medical school are situated so far from each other that the only feasible way for giving the combined courses is to send a student for one or two years to the college and then start him in the medical school courses in his third year. In the two years of preliminary college study, the premedical sciences, chemistry, biology, and physics, must be included and the objections which have already been raised against giving these sciences to medical students in general college courses exclusively, obtains also in this case. There is a still more serious objection to the plan, namely, that the four years that are left after the college course is completed, form decidedly too brief a period in which to study the fundamental medical sciences of anatomy, physiology, biochemistry, pharmacology, pathology, and bacteriology, and at the same time afford the student adequate opportunities to study disease at first hand in the clinic. Indeed, with the clinical instruction now demanding the greater part of three years, it is obvious that the subdivision of the six years into two at college and four at medical school leaves little over a year for study in the fundamental sciences upon which the whole practice of medicine and surgery immediately depends.

In Toronto, as in other Canadian Universities, we are in the fortunate position of having the medical schools closely linked with the academic colleges, thus making it possible to interweave the academic with the medical studies. This close intimacy admits of cultural studies being taken side by side with the premedical sciences of the first part of the medical curriculum, and it permits of an earlier start being made in the fundamental medical sciences such as anatomy and physiology and their various allied subjects.

Medical education in Canada has always been considered to be, on the average, on a higher general plane of efficiency than in the States, but we must remember that if we are to retain this prestige we must advance *pari passu* with the advances that are being made there. If we fail to make use of whatever advantages we may have in providing for a sound education for our medical graduates, we may find ourselves unable to maintain our place in the forefront as institutions of medical learning on this continent.

It is particularly in the designing of the six year combined

course that we have an advantage, for we are in a position to integrate the arts and medical courses. We must see that with this advantage we succeed in producing a better trained type of medical practitioner.

In framing the six years' curriculum for this university, the following principles have been adhered to:—First, the course must be graded so that related subjects fit together in proper sequence and without any break in continuity. In a general way it may be stated that the practice of medicine and surgery depends on the application of the methods and laws of physics, chemistry, and biology, in the interpretation of disease. It is important, therefore, to frame the curriculum so that the principles of each of these sciences shall run continuously throughout the entire combined course Of the finished fabric of medical education they must form the warp, and their application in medical and surgical practice must form the woof For this, among other reasons these sciences should be given at the very beginning of the six years' course, and each of them shou d b continued throughout the course, mod fied as this proceeds from stage to stage, so as to train the student to apply their methods in the investigation and treatment of disease. Biology, for example, starting with the subject of zoology in the first year, should be continued into the second and third in the form of anatomy, and in the subsequent years as pathology and surg ca' anatomy. The chemistry of the first and second years should be continued in the third as biochemistry, in the fourth as pathological chemistry, and then should find its final application in the clinical laboratory. Physics should be continued in the second year as physical chemistry, in the third as physiology, in the fourth as pharmacology and physical diagnosis, and in the final years receive its application in practically every field of medicine and surgery.

But in carrying out these principles of keeping the student throughout his course constantly in touch with the fundamental subjects, adequate provision must also be mad for the judicious inclusion throughout the earlier years at least of courses that will train the mind to think broadly in fields of learning that are not nece sari'y those of medical practice. For most students only a little time can be found for these cultural courses during the first year of his attendance at medical school, for during this year he must devot practically all his attention to study in the premedical sciences. He must lay his foundation in these subjects deep and true, so tha the superstructure which will have to be added in later

years may be built strongly and in good proportions. It is more particularly during the second and third years of his medical course, therefore, that a place should be found for cultural studies, an arrangement which has the added advantage that the student, being now more mature is better fitted to appreciate at their true value the various cultural subjects which it is possible for him to take. In making this latter statement, I do not shut my eyes to the fact that the average student after he has been for a year or so at the medical school becomes impatient to enter upon what he is pleased to consider the more important part of his training, namely, practical work in the clinics Having as yet had no experience in these fields, he may find it difficult to appreciate the fundamental necessity for a thorough grounding not only in the preliminary medical sciences, but also, and probably to a greater extent in the several college subjects that are ancillary only to medical education. It is particularly at this stage in his course that the student should be guided by some member of the faculty in the selection of the courses which will best prepare him for his life work.

In selecting the college subjects which a student should take, it is fundamental to appreciate that different types of study are likely to appeal to different minds, and it is important that the time which is available for work of this character should be more or less at the disposal of the student himself. He should be required during this time to take as options some college courses, but the final selection of these should be left to him, under the guidance of a class adviser. In order that these principles may be met, it is important for practical reasons that lists be prepared which will show the college courses available to the student during the periods he is free to attend them. Time will not permit me to indicate the reasons for the selection of all of the subjects from which the student may choose his options in this university. There are certain subjects, however, for the selection of which as options it may be interesting to indicate the reasons. Let us take, for example, the selection of psychology. In addition to the regular course in physiological psychology, which is a part of the regular medical schedule, and is required of all students, courses in this subject are offered as options during the second and third years. What it may be asked is the reason for advising a medical student to take extra college courses in psychology. The answer is that since it is with human beings, often indeed in an abnormal mental state, and not with dead machines or unconscious animals that the physician as well as the surgeon has to deal, he should make himself familiar

with the methods for the study of the human mind, for the interpretation of human actions, and for the anaylsis of human intellect. To disregard the basic principle of psychology in the examination of a patient deprives the physician not only of a most important aid in the true evaluation of subjective symptoms, but also of a most valuable measure in the treatment of the disease. I do not think I overstate the case when I say that it is because of disregard of psychological principles in treatment that many physicians lose hold of the confidence of their patients. Without this confidence, scientific trea ment is not infrequently of no avail. Quite apart from these reasons, which make it important or the general physician to have studied psychology, there are certain students contemplating specialization in psycho-pathology who should elect even further study in the department of psychology.

A most important subject for those students who decide to specialize in laboratory subjects or in hygiene is mathematics. It is but recently that the methods of the mathematician have been applied in the study of biological problems, and it has followed as a natural sequence that the methods have demonstrated themselves to be of great value in the elucidation of many problems of medical science as well. Particularly is this the case in the sciences of biochemistry, pathological chemistry, physiology, immunology and hygiene.

Another group of optional subjects having a less evident relationship to the functions of the physician is that which includes English, philosophy and history It is more particularly among these groups of subjects that we must seek for that cultural training which is to equip the mind to comprehend things in a broad and balanced way. Like many things that really, after all, count for most in determining the destinies not only of individuals but of groups of individuals, there is in these cultural studies an undefinable something, which is of incalculable value in all walks of life, but probably in none more so than in that of the medical practitioner.

It is scarcely necessary to give the reasons for the selection of modern languages. The choice of these as options by a very large proportion of the present entering class, which is the first actually to come under the six years requirements in this university, testifies to their self-evident value in the training of the medical student.

Of the other subjects offered as options notice may also be taken of the value to the medical practitioner of a study of the principles of economics. To no member of the community more

than to him can a knowledge of economics be of greater value, particularly that part of it which deals with the management and care of the poor. The physician is a necessary part of every sociological system.

All of the optional time must not, however, be absorbed by these more strictly cultural studies. At least two other important uses of it must be borne in mind, first, since the required courses in the pre-medical and the fundamental medical sciences are necessarily elementary, it is important to offer as options more advanced courses in these subjects during the second and third years for students who may have inclination to continue their studies in them. And, secondly, to afford opportunity for those students who have proven themselves to be less competent than the average, to repeat some of the subjects of the first two years, although they may have passed the required examinations.

By the time the end of the third year is reached, the student is prepared to proceed to his clinical studies, and it is at this stage that opportunity will be offered for certain students who may desire to specialize further in laboratory studies, to break away from the regular course so as to s end a year or more in advanced work in one or other of the scientific departments. For those who contemplate becoming teachers and investigators, this extra year in the laboratory, following immediately upon the regular courses, must obviously be of great value. It will add to the systematic instruction given in the regular courses that personal experience in the laboratory which is essential in the training of even the most junior scientific worker. In order to encourage students to take advantage of this advanced instruction, it has been decided to offer the degree of D.Sc. (Med.) to those who take this extra year and who show by examination and in other ways that they have profited by it. The granting of the B.Sc. (Med.) in the middle of the medical course has in general two objects in view:—First, to afford to students who may have found as a result of their three years study in the premedical and fundamental medical sciences that it is decidedly in these fields, rather than in that of medical practice, that their inclinations lie, an opportunity to discontinue the medical courses in order to pursue scientific careers in other fields. The degree affords the official recognition by the university that the student has undergone a training qualifying him to undertake more intensive study in some special field of natural science. Second, to encourage certain of the better and more ambitious students to spend an extra year in the laboratories, either before entering or

after completing their clinical studies,* so that they may be more highly trained in the fundamental sciences of medicine. This year of extra scientific training will indubitably train the student to have a broader vision, a clearer method of thought, and a keener appreciation of the relation of pure science to medical and surgical practice. It will, moreover, and this I believe to be most important, train the mind in self-criticism.

*To make this possible, the B.Sc. (Med.) is also open to graduates in Medicine, but they must spend an extra year in one of the laboratories.

Rogers of the Cincinnati Tuberculosis Sanatorium reports further experiments on the production of pulmonary tuberculosis in guinea-pigs by the inhalation of tuberculosis material. In all the experiments the guinea-pigs were wrapped so that only their nostrils were exposed to the spraying. All animals given a single spraying of five minutes with a suspension of tuberculous sputum developed pulmonary tuberculosis. Particles of tuberculosis sputum containing tubercle bacilli placed on the normal nasal mucous membrane brought about tuberculous changes in the cervical lymphatic glands, with involvement of the lungs, liver and spleen later.—*Amer. Review of Tuberculosis*, vol iii, No. 12.

FIBROMYOMATA—ESPECIAL REFERENCE TO RADIUM TREATMENT

By Everett S. Hicks

Brantford, Ont.

FIBROMYOMATA of the uterus are met with frequently. It is estimated that thirty-three per cent. of women have fibroids large or small at some time during their life. It is rare to see them clinically present, that is, producing symptoms before the age of thirty, but from the age of thirty to fifty they become increasingly frequent. We removed four by myomectomy in a girl of eighteen while operating for retroversion and chronic appendicitis. Very little is known in regard to the cause of these tumours, but it seems fair to assume that both their onset and growth bears some relation to the menstrual function. This is borne out by the fact that single women who are sterile are more prone to fibroids than are married women, and married women who are sterile have more fibroids than those who have borne children. The fibroids may be the cause of sterility in some cases, but sterility and the single life certainly increase the percentage of fibroids. Their active period coincides with the menstrual function and no new ones form after the menopause.

They are composed of fibrous tissue and smooth muscle fibres arranged without any definite order and appear as an outcropping from the body of the uterus, practically always from above the internal os. The uterus is enlarged and its mucosa hypertrophied, but the uterine circulation is not as much increased as one would suppose, myomata having a poor blood supply.

Myomata are classed according to their location, as:—

1. Subserous. The subserous type are covered on all sides by peritoneum and have as their pedicle their blood vessel and the peritoneum. If they grow out into the folds of the broad ligament we call them intraligamentary.

2. Interstitial. Myomata which are muscle covered, thickly on one side, thinly on the other, according to direction of growth.

3. Submucous. Myomata which projects into the uterine cavity.

Read before the Elgin County Medical Society at St. Thomas, November 1st, 1919.

4. Cervical. A rare variety.

Clinical symptoms. 1. Hæmorrhage is the prominent symptom in seventy-five per cent. of the cases. It varies from a simple increase of the menstrual times and flowings to a profuse sudden flooding, or a daily severe flow. It brings in its train the line of anæmic symptoms that we see so markedly in many of these cases, the yellow chlorotic like type, the shortness of breath, heart palpitation and loss of ambition. In single subserous tumours, hæmorrhage may not be a symptom. In submucous cases it is a marked symptom. The usual case has multiple tumours, probably one of each variety, and the hæmorrhage will be moderate or severe according to the predominating type.

2. Pain. Fifty per cent. of our cases were free from pain and a large number free of any discomfort. Pain of a severe type means one of three things: (*a*) Dysmenorrhœa due to a small fibroid; (*b*) An attempt to expel a submucous fibroid; or (*c*) Some complication, tubal inflammation, appendicitis, pressure symptoms.

3. Pressure symptoms include dyspnœa due to the size of the growth, pelvic weight, bladder or rectal difficulties, œdema of the legs, pressure on ureters and referred pains down the limbs due to direct nerve pressure.

4. Minor symptoms are leucorrhœa, sterility and repeated miscarriages.

Clinical signs are mainly from palpation. We find usually a fair sized firm tumour, round in outline with at times irregular bosses, each hard and distinct. Mobility is a marked feature, except in the very large tumours and those of smaller type that have become wedged into the pelvis and have formed a pelvic cast. In thin walled patients, by pressing in above the pubes, the round ligaments can be rolled under the fingers and the tumour mapped out above. With such signs the diagnosis of the subserous type is fairly certain.

In submucous cases we can feel the choked cervix or the actual tumour projecting through the cervical canal. In many cases of the interstitial variety the cervix will be carried high up or will feel like a dimple on the tumour mass.

The sound will show an elongated uterus. We rarely use the sound as a diagnostic aid.

Differential Diagnosis. Subserous type: From tumours of adnexa or parametrium, ovarian tumours, hæmatocele and hæmatoma, pyosalpinx and hydrosalpinx, round ligament tumours, omental tumours. Interstitial type: Pregnancy, chronic metritis. Submucous type: Mucous polypus, abortive and ectopic

gestation, inverted uterine body, carcinoma, chorio-epithelioma. In all cases try and exclude: (1) Pregnancy; (2) surrounding inflammations; (3) carcinoma—with hæmorrhage irregular, slighter, due to some easily known cause, persistent watery discharge, recurring pains and appearance of cervix; (4) Sarcoma—hæmorhages and cachexia; (5) degenerations—necrosis, cystic collections, calcifications. Degenerations are indicated by sudden growth.

Treatment. Not all fibroids require treatment.

Operative treatment. Supra-vaginal hysterectomy is the favourite operation. Have the patient in the Trendelenburg position. Make a median abdominal incision carrying it well down to the pubes, grasp uterus with forceps, pull down omentum if possible and pack off the intestines with gauze. Apply clamps to the round and broad ligaments together close to the uterus. Tie off both ligaments separately close to this clamp. Cut the broad ligament close to the round ligament. Push down with gauze and the uterine artery region will be exposed. Do the opposite side. We now have only three forceps in the abdomen. Grasp these in one hand and pull up and back, thus outlining the bladder. Cut well away from the bladder with blunt scissors, making a generous anterior flap. Do not make a posterior flap. Apply clamp on one side to the uterine artery at about the level of the internal os and about three-quarters of an inch higher, apply a second clamp; cut between them and on through the cervix pulling up strongly at the same time. As the opposite side of the cervix is reached, it parts with a little snap and the uterine artery stands out practically by itself and may be grasped easily. When the uterus is lifted out we have only two clamps in the pelvis, one on each artery.

The cervix is grasped with tenacula and a ligature passed on each side. The long ends of this can be used to tie the uterines. Double tie all the large vessels. Pass another ligature on each side through cervix, round and broad ligaments drawing all together snugly and in this manner raising the cervical stump. Suture the free edges of peritoneum or simply attach the bladder flap to the back of the uterus.

Myomectomy in young women desirous of child-bearing is the operation of choice. An incision is made around the tumour in such a way as to leave some flap. The tumour is shelled out and the cavity closed with interrupted cat-gut sutures carefully placed. In larger tumours we can partially control the bleeding by temporarily clamping the larger accessible vessels.

Treatment by Radium and Gamma Rays. Radium and hard rays generally have been in use now for some time. In 1915 I

found in Johns Hopkins Hospital library reports of twenty-five hundred cases. Since then it has been more and more used on this continent and practitioners such as Kelly, of Baltimore; Clark, of Philadelphia; Schmidt, of Chicago; and Dr. Stacey, of the Mayo Clinic, are reporting series varying from two hundred and fifty down.

Radium we use in its tube form—a glass capsule in a silver container. This is enclosed in a special capsule of a brass alloy to which is fastened a chain, the chain being fastened to the napkin or a bandage to guard against almost loss of the radium. The capsule is enclosed in a rubber finger cot. The patient is prepared as for a curettage, no anæsthetic is given as a rule. Morphine is given to allay nervousness, and Hagar's dilators used one after the other till the operator feels that he can insert the radium apparatus. This takes about one half the dilatation one needs for an ordinary curettage. Many of these myomatous uteri have very patulous canals and the radium can be easily inserted. We have used as a general anæsthetic a few whiffs of ether in cases with a hard cervix and small canal. In all cases clinically doubtful, a curettage is performed if necessary under ether and carcinoma excluded.

We are using one thousand to one thousand, eight hundred milligram hours at one dose, and in the majority of cases one dose will suffice. The patient is kept in bed from two to four days. In some cases we have combined this method with hard ray treatment from special x-ray tubes, using 20-x to each field. The tumours disappear more or less rapidly according to the type. The time varying from three months to a year.

In a period of six years we have treated by the ray treatment approximately one hundred cases. Our results have been:

(1) Absolute failure—two.

(2) All symptoms relieved, tumour largely reduced—twelve cases.

(3) All symptoms relieved, tumour small—seventeen cases.

(4) All symptoms relieved, no appreciable tumour—fifty-three cases.

(5) Recent cases, too recent to classify—fourteen cases. Twelve at least of these patients will be cured.

Our absolute failures were both in calcified fibroids. One in a diabetic aged sixty-five; the other a patient aged fifty-four. Neither were relieved in any way and the second patient we operated on. Coming from Johns Hopkins in 1914, fresh from seeing Dr. Kelly's work, we made the mistake of treating some unsuitable cases. At that time no one knew just how to distinguish the fav-

ourable cases from the unfavourable. In the future following the lead of Dr. Kelly of Johns Hopkins and Dr. Clark of Philadelphia, we will regard as suitable cases all uncomplicated fibroids up to the size of a five months' pregnancy.

We will regard as unsuitable cases (1) any tumour extending above the umbilicus; (2) any tumour having inflammatory lesions of other organs as a complication; (3) any tumour with any suspicion of malignancy; (4) any tumour causing severe pressure symptoms.

We will regard as especially suitable (1) all fibroids of the above size in patients over forty years of age; (2) all such fibroids not producing severe pressure symptoms; (3) fibroids in which hæmorrhage is the chief symptom; (4) fibroids of any size in bad surgical risks when hæmorrhage and not pressure is their chief symptom.

The disadvantages of radium as a treatment are:

(1) To the patient, some slight nausea in about five per cent. of the cases. There is practically no pain nor tenderness.

(2) To the surgeon the disadvantage may be summed up in one word; the fear of overlooking a possible carcinoma. Thus far we have escaped this mistake. The cases of carcinoma we have seen in this six years' work have been very easy to diagnose in the majority of cases.

The advantages of radium treatment:

(1) Its safety. No deaths are reported by any worker.

(2) No loss of patients' time in treatment nor in convalescence.

(3) The expense is about one-half the total cost of operation.

(4) Patients are in better general health than after operation.

(5) Radium can be used where operative mortality would be high, as in chronic nephritis, diabetes, severe anæmias, heart lesions or tuberculosis.

(The history of a number of cases, some operative, some radium cases are omitted.)

Practically we find that we meet three or four cases suitable for radium treatment to each operative case.

In conclusion I must state that none of this work is original. I desire to express my appreciation for personal demonstrations of their work to Dr. Graves of Boston for his operative technique and his method of using radium. To Dr. Leda Stacey of the Mayo Clinic for a description of the methods there employed. To Dr. Burnam, the associate of Dr. Howard Kelly, for his advice on different occasions. And Dr. Schmidt of the Augustana Hospital of Chicago for his kindness in allowing me to obtain duplicates of his intra-uterine radium screen.

INCIPIENT DIABETES MELLITUS*

By Edward H. Mason, M.D.

and

Colin G. Sutherland, M.D.

WITHIN the last few months there have been admitted to this clinic four cases which should properly be clasified as ones of incipient diabetes mellitus. In the case of all four, their glycosuria was of a transitory nature, discovered accidentally, there being no symptoms referrable to its occurrence. Two of them were detected at life insurance examinations, while the other two were discovered while other examinations were being conducted. Three of the cases were adult males, and one was an adult female.

An account of these cases appears justified in view of the increasing importance of the diagnosis of incipient diabetes mellitus. The findings follow:

Case 1. J. M., case No. 31770, admitted January 26th, 1920. Male, age forty-three, lawyer. In May, 1919, while taking a life insurance examination, a reducing body was found in his urine. With subsequent tests it was found to be of transitory appearance. No symptoms. Personal and family histories negative. Physical examination negative. Weight, 75 kilos. Blood pressure: systolic, 110; diastolic, 80. Urine negative upon admission.

Glucose curve after 100 grams of glucose by mouth on fasting stomach in 300 cc. of coffee follows.

Time	Blood Sugar, per cent.	Urine			
		Amount	Sp. Gr.	Glucose Per cent.	Glucose Grams.
8.45 a.m.	0·147				
9.00 "	.....	120 c.c.	1022	0·	0·
9.30 "	0·214				
10.00 "	0·220	65 c.c.	1023	0·81	0·52
10.30 "	0·147				
11.00 "	0·117	90 c.c.	1017	0·	0·
12.00 noon	0·092	130 c.c.	1010	0·	0·
2.00 p.m.	0·194	195 c.c.	1012	0·	0·
4.00 "	0·130	180 c.c.	1018	0·	0·
6.00 "	0·120	140 c.c.	1023	0·	0·

* From the metabolism clinic of the Royal Victoria Hospital, Montreal.

Note. Extra fluid 200 c.c. at 10.00 a.m. and 11.00 a.m. Light lunch without sugar at 12.30 p.m.

Kidney Function. Upon Mosenthal's nephritic test meal, night urine was 375 c.c. with a specific gravity of 1027. Specific gravity varied from 1019 to 1028. Concentration of nitrogen at night was 1·27 per cent. Study of rate of urea and chloride excretion gave a blood urea of 0·285 grams per litre, with a McLean's Index of 98·5 (Ambard Constant 0·081). The plasma chlorides were 6·01 grams per litre and the chloride threshold was 5·86 grams per litre (theoretical 5·62).

A further attempt was made to force glycosuria if possible by high carbohydrate feeding. Accordingly the patient was placed upon a diet giving 40 calories per kilo, and containing 487 grams of carbohydrate, 200 of which was in the form of sugar. This carbohydrate was evenly divided between the three meals of the day. On the second day upon this intake there was a slight glycosuria during the digestion period of the noon meal, there being actually excreted 0·48 grams of glucose.

Case 2. J. F., case No. 32016, admitted February 23rd, 1920. Male, age thirty-six, salesman. A few days previously at a life insurance examination glucose was found in his urine. No symptoms. Past history is negative. Had one sister died from diabetes mellitus at age of twenty-six years. Physical examination negative. Weight, 71 kilos. Blood pressure: systolic, 135; diastolic, 82. Wassermann upon blood negative. Urine negative with no glucose upon admission.

	Glucose curve	Urine			
				Glucose	
Time	Blood Sugar, per cent.	Amount	Sp. Gr.	Per cent.	Grams.
8.45 a.m.....	0·122				
9.00 "		36 c.c.	1035	0·	0·
9.30 "	0·227				
10.00 "	0·348	16 c.c.	1035	1·75	0·28
10.30 "	0·306				
11.00 "	0·256	44 c.c.	1040	5·65	2·48
12.00 noon.....	0·192	162 c.c.	1010	0·29	0·47
2.00 p.m.....	0·009	260 c.c.	1011	0·	0·
4.00 "	0·119	84 c.c.	1030	0·	0·
6.00 "	0·138	80 c.c.	1027	0·	0·

Note. No breakfast. 100 grams glucose in 300 c.c. coffee at 9.00 a.m. Extra fluid, 200 c.c. at 10.00 a.m. and 11.00 a.m. Light lunch with no sugar at 12.30 p.m. and light supper with no sugar at 5.30 p.m..

Case 3. C. W. S., case No. 32032, admitted February 26th, 1920. Male, age thirty-six, salesman. Sugar discovered in urine

in October, 1919. No symptoms. Since that time has kept to no diet and glycosuria has been of a transitory nature. Personal history negative. Family history, paternal uncle died of diabetes at age of eighty-four years. Otherwise negative. Weight, 64 kilos. Urine negative upon admission.

Glucose curve after 100 grams of glucose by mouth on fasting stomach in 300 c.c. of coffee.

Time	Blood Sugar, per cent.	Urine Amount	Sp. Gr.	Glucose Per cent.	Glucose Grams.
8.45 a.m.....	0·116				
9.00 "		97 c.c.	1030	0·	0·
9.30 "	0·144				
10.00 "	0·211	72 c.c.	1026	0·43	0·3
10.30 "	0·217				
11.00 "	0·182	90 c.c.	1028	1·46	1·3
12.00 noon.....	0·118	95 c.c.	1015	0·	0·
2.00 p.m.....	0·145	134 c.c.	1018	0·	0·
4.00 "	0·130	155 c.c.	1012	0·	0·
6.00 "	0·134	112 c.c.	1026	0·	0·

Note. Extra fluid, 200 c.c. water at 10.00 a.m. and 11.00 a.m. Light lunch without sugar at 12.30 p.m.

Case 4. V. G. McC., case No. 31700, admitted January 15th, 1920. Female, age fifty-four, at home. On January 5th, 1920, sugar was found in urine when seen by doctor for dyspnœa. No symptoms referable to glycosuria. Personal and family histories negative. Physical examination showed well developed woman. Moderate sized adenomatous goitre, bilateral. Heart slightly enlarged to left with soft systolic murmur, which is transmitted to axilla. Spleen and liver just palpable. Blood: R.B.C., 5,730,000; W.B.C., 5,400; H.B., 100 per cent. Weight, 72 kilos. Blood pressure: systolic, 140; diastolic, 80. Gœtsch test for hyperthyroidism negative.

Glucose curve after 100 grams of glucose by mouth on fasting stomach in 300 c.c. coffee.

Time	Blood Sugar, per cent.	Urine Amount	Sp. Gr.	Glucose Per cent.	Glucose Grams.
8.45 a.m.....	0·140				
9.00 "		115 c.c.	1026	0	0
9.30 "	0·208				
10.00 "	0·202	45 c.c.	1024	0	0
10.30 "	0·226				
11.00 "	0·234	220 c.c.	1007	0	0
12.00 noon.....	0·150	195 c.c.	1007	0	0

Note. Extra fluid, 200 c.c. water at 10.00 a.m. and 11.00 a.m.

Kidney function. With Mosenthal's test meal, night urine was 380 c.c.; the specific gravity varied from 1015 to 1031, and nitrogen was concentrated at night to 1·2 per cent.

Urea and chloride excretion studies showed a blood urea of 0·3 grams per litre with a plasma chlorides of 6·25 grams per litre. McLean's Index was 89, giving an Ambard Constant of 0.085. The chloride threshold in the kidney was at 5·804 grams per litre.

From a consideration of the above glucose curves, the following facts are evident. In no instance did the blood sugar show a normal curve after the administration of 100 grams of glucose on a fasting stomach. The highest figure was 0·348 per cent. a blood sugar frequently not exceeded in many outspoken cases of diabetes mellitus when subjected to a similar proceeding. The rise of blood sugar was delayed, the average height being reached in 1·3 hours after the glucose was taken. In all instances except one, there was a slight glycosuria. The fasting blood sugar averaged 0·131 per cent. and returned to its fasting level after an average of 2·8 hours. The glucose threshold in the kidneys, as estimated on the fall of the curve, averaged 0·192 per cent., in two cases it being markedly raised, the figures falling at 0·2 per cent. and 0·226 per cent. In the latter instance there was no glycosuria so the threshold, not being actually determined, was higher than the stated figure. These glucose thresholds are definitely raised above the normal level (normal 0·16 per cent. to 0·18 per cent.), and when one considers that the threshold is usually lower in a falling glucose curve than in a rising, it increases their significance.

The kidney function was negative in all cases both by ordinary urinalysis and in two of the cases by more complete studies. Therefore a low grade nephritis could not in part account for the results obtained.

It appears that these cases run their transitory glycosurias during the digestion of meals at a time corresponding to the maximum increase in blood sugar. Many of them are probably very sensitive to their carbohydrate intake, as well evidenced in Case 1, when at 2 p.m. the hyperglycæmia had reached 0·194 per cent. upon a light meal without sugar taken one and a half hours previously.

In view of such findings we feel justified in classifying these cases as ones of incipient diabetes mellitus. Just how strict their diabetic restrictions should be is an open question, but an attempt should be made to maintain a normal fasting blood sugar. This type of case if studied at rather frequent intervals, their diet being meanwhile controlled, should offer very interesting data as regards the inherent tendency of diabetes mellitus to progress.

HEAT AND INFANT MORTALITY

By Albert Jobin, M.D.

Associate professor of Pœdiatrics, Laval University, Quebec

IN the beginning let me make a short digression from my subject. Taking the statistics of the infant mortality of thirty-one countries during a period of twenty-five years we find that it compares with the general mortality in the ratio of 10 to 1·9. In Quebec province the mortality of the cities is about two hundred per thousand and the average infant mortality is about two hundred per thousand births. Races with a higher birth rate show also a higher rate of infant mortality; hence we must not be unduly alarmed at our high rate of mortality as this is a necessary condition of our high birth rate. Is one justified, however, in saying that our infant mortality is not excessive? No, far from that; but I believe that our infant mortality bears about an average proportion to the birth rate, though I cannot furnish scientific proof of my statement. To be perfectly just to French-Canadians, their rate of infant mortality should be compared with the infant mortality of other prolific races, in which case we should probably have a better position given to us than is generally accorded.

The summer, and especially the warmest part of it, is the season of the year during which we meet with the highest infant mortality, and digestive troubles form the principal cause of death. At one time bacteria were considered to be the cause of all gastro-intestinal affections and the use of sterile milk was thought to be the means of preventing them. To-day, however, clinical men and laboratory workers have demonstrated that the microbe is only one of several ætiological agents. If in certain cases the bacterial contamination of the milk is sufficient to produce illness, in others, and they are the more numerous, its intervention is only secondary, and it becomes pathogenic only on account of a series of accompanying conditions which facilitate and augment its action. Among these conditions the high temperature of the surrounding air is frequently sufficient to determine the onset of digestive affections independent

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of all bacterial action. In fact high temperature of the surrounding air must be put in the first place as a factor in infant mortality. Children, especially nursing children, are much more susceptible to atmospheric variations than adults, for the reason that the temperature of the child's skin is three or four degrees higher than that of the adult's. It is also an established fact that raising the atmospheric temperature will increase the temperature of the child's body. In other words a baby eliminates badly its bodily heat, and this shows the necessity during periods of great heat of keeping a watch on the temperature of the room, and of avoiding too warm clothing for the infant. Many practising physicians have observed rapid deaths among infants during very hot weather, often after only a few hours' illness. These cases are in reality sunstrokes, even though the atmospheric temperature is not over 70°F; the symptoms present, namely, fever, rapid pulse, epileptiform convulsions, coma and death, are those of insulation. Many no doubt will say that the high temperature acts by altering the constitutents of the child's food. In answer to that I will point out that Thiemick, Keller, and others have demonstrated that these alterations, as for instance the decomposition of milk by saprophytes, hardly produce any ill effects during the cold season and that winter diarrhœas are seldom fatal.

It is also a fact that infants fed on sterilized food such as condensed milk fare worse during the hot weather as regards diarrhœas than those fed on cow's milk of the proper strength.

Many reasons explain why summer diarrhœas are so fatal in children. First, heat depresses the nervous system of a nursing child, reduces its appetite and upsets the normal functions of its organs, thus diminishing its resistance to intoxications and infections. Again, under the influence of heat there is an increase in the number and virulence of the habitual microbes of the bowel. Lastly, Maurel has pointed out that during the summer the requirements of the organism are nearly one-third less than during the winter, and thus a continuation of the same diet results in a relative overfeeding sufficient to produce diarrhœa. It is known also that heat increases the activity of saprophytic and putrefactive organisms and especially is this the case with milk, which under these conditions becomes a real poison. I can recall the case of a strong man who during the summer of 1916 died within twenty-four hours after taking a pint of sour milk.

Dryness, which ordinarily accompanies continued heat, makes the sanitary conditions worse. During a period of dryness when the

pasture grounds are dried up, cattle are often fed with fermented pulps, such as malted grains and the quality of the milk becomes much poorer. In Tourcoing and generally throughout northern France serious epidemics of cholera infantum coincide with the dry years. During 1915 and 1916 the summers were extremely warm and dry, and in the district of Quebec cattle had to be fed on malt grains with resulting deterioration in the quality of the milk; the drinking water was also of bad quality and, as shown by the investigations of Dr. Emile Nadeau, the infant mortality was abnormally high. The water in the St. Charles river, which furnishes the supply to Quebec city, was so low that the city water supply tasted of the mud in the bottom of the river, and as a result an unduly large proportion of the adult population suffered from intestinal diseases.

Another cause of the relatively high mortality in babies living in the city is that small houses tend to store the heat of the day and it is this excessive heat which makes the city, especially the poorer parts of it, show such a heavy infant mortality. In 1898, Dr. Helmholz investigating this point in a suburb of Chicago found that in 1374 houses only 30 had an interior temperature below 80°F. and in 1344 houses the temperature indoors was 30 degrees higher than out of doors.

The following table is prepared from the register of the St. Charles cemetery where all the citizens of the lower town bury their dead and includes all deaths under one year exclusive of those still-born and those dying within a few hours after birth. This lower part of the city has a population of 55,000, largely labourers, living in small houses closely huddled together, and the temperature of the surrounding air is five or six degrees higher than that of the Observatory on the high ground. The temperatures recorded are those obtained from the Observatory records. Note the difference in mortality between the summers of 1915 and 1916 as compared with 1917 and 1918. The average rainfall during the months of July and August is about eight inches and it will be noted that besides being hotter the two years showing the high rate of mortality showed a rainfall much below normal and the two cooler summers showed a precipitation very much above the average:

Year	Population	Deaths	Rainfall	Humidity	Temperature	
					July	August
1915.....	50,304	240	4·51 ins	72%	77	78
1916.....	53,882	268	4·41 ins	72%	80·6	75·9
1917.....	56,933	136	10·17 ins	80%	76·4	74·2
1918.....	56,450	118	10·70 ins	78%	75·1	72·1

In conclusion I claim that poor elimination of the body heat, food in excessive amount, and the depressing influence of a prolonged atmospheric temperature are the three great reasons why infant mortality is so high during the summer. To eliminate these causes we must watch the temperature of the child's room and cut down the food to about two-thirds of the ordinary allowance making up any loss in fluids by giving water in sufficient amount. The child should also be lightly clothed and kept in the coolest and best ventilated room. During the heat of the day windows should be closed and opened during the night, in order to store as far as possible the cooler air of the night.

In 1907, the United States Public Health Service made a notable study of the milk situation in its relation to the public health. Pasteurization of milk was urged as the only dependable means of eliminating milk as a carrier of certain communicable diseases, scarlet fever, diphtheria, septic sore throat and typhoid fever. Following this, a commission appointed to consider the milk question, as it affected the city of Washington recommended municipal pasteurization.

The present view of experienced health authorities is well reflected in the following resolution adopted not long ago by the national committee on milk standards: Resolved,—That all milk, including that which enters into the preparation of milk products, especially ice cream, be pasteurized and the efficiency of the process be controlled; that such milk be reduced to a proper temperature at the source of supply, and kept at that temperature during transportation and until consumed.

Obiter Scripta

FROM CASE REPORTS IN THE MEDICAL CLINIC, ROYAL VICTORIA HOSPITAL, MONTREAL. SERVICE DR. W. F. HAMILTON

CASE 1. *Fatal Hæmorrhage from Duodenal Ulcer.*

C. M., Italian labourer, age fifty, admitted April 7th, 1920. The patient complained of a "sore stomach" and stated that he had suffered from a severe pain in the region of the gall bladder for two months. The pain was constant, varying only in intensity; it did not radiate to the shoulder blades, neither was it associated with jaundice or vomiting.

A detailed history was not obtainable as the patient spoke very broken English. Vomiting and loss of weight were denied. The personal history was not important except for a somewhat similar attack two years ago, from which he said he recovered completely.

The physical examination revealed a pale rather under-nourished male, looking the stated age. The teeth were well preserved, but poorly kept. The tongue was covered with a dirty white coat. The abdomen was apparently quite symmetrical and participated in the respiratory movement. No peristalsis was seen. On palpation the muscular wall was thin and rather atrophic, and the lax subcutaneous tissues rather belied the statement of no loss of weight. Abdominal palpation was easily performed, and revealed a large number of masses thought to be fæcal. Acute tenderness, and very little, if indeed, any muscular rigidity were felt in the region of the gall bladder. The rectal examination was negative.

The examination of the other systems was negative except for a very low blood pressure (105-69) and an indefinite systolic murmur over the heart apex.

The blood count showed 6,600 white blood cells, 2,120,000 red blood cells, with 53 per cent. hæmoglobin (Tallquist). Although a specimen of stool was ordered on admission, yet it was some days before the specimen was obtained so great was the difficulty of making the patient understand. The result of an enema, however, showed quantities of old black blood.

With the location of the pain, and the evidence of hæmorrhage, the diagnosis of a bleeding duodenal ulcer seemed quite certain, especially as the taking of food apparently had little if any relation to the pain. In spite of the prompt administration of standard remedies for internal hæmorrhage—opium, horse serum apd calcium lactate—the anæmia became graver and graver, and finally ten days after admission the patient died.

During his stay in the hospital the patient's temperature varied from 102° F. to normal.

The pathological report confirmed the diagnosis of pyloric ulcer. "The intestines contained half a basin full of brownish-black, foul-smelling fluid material, and two clots about the size of the little finger. The stomach showed no gross abnormality. One cm. below the pyloric ring on the posterior surface of the duodenum there was a large quadrilateral ulcer measuring 1·5 x 1·8 cm. and ·7 cm. deep. The base was formed by the head of the pancreas. The bile duct exposed in the base of the ulcer was ulcerated quite through so that bile could pass from the gall bladder into the duodenal ulcer. The gaping end of a short branch of the hepatic artery 2 mm. in diamter was also exposed in the ulcer, thus disclosing the source of the debilitating and fatal hæmorrhage. The head of the pancreas and the edges of this ulcer were very hard and firm."

CASE 2. *Fatal Hœmorrhage from an Indolent Gastric Ulcer.*

W. H., Chinese laundryman, age thirty-six, admitted April 28th, 1920, died May 9th, 1920. The patient complained of pain in the abdomen. The only history obtainable was that he had been sick for three weeks with pain in the abdomen, and had eaten practically nothing. No history of vomiting or melæna could be elicited. The family history and personal history were not ascertained. The physical examination revealed a very pale much emaciated Chinaman of apparently the stated age, with an icteroid hue in the conjunctiva.

The abdomen was markedly scaphoid with a fulness of the epigastrium where a diffuse pulsation could be seen, evidently of the aorta. Peristalsis was not visible. Corresponding to the epigastric fulness there was an ill-defined soft orange-sized mass which pulsates. There was marked rigidity of the right rectus muscle, and extreme tenderness in the locality of the mass. The rectal exmaination was negative.

An examination of the other systems was practically negative. The blood count showed 6,600 white blood cells, 3,230,000 red blood cells, 55 per cent. hæmoglobin (Tallquist).

An enema was given almost immediately on admission, and black material was obtained sharply positive to the benzidine test. In view of these findings a diagnosis of a bleeding gastric or duodenal ulcer was made.

An operation was considered. An opinion was obtained in consultation with a surgeon, but it was decided to institute medical treatment, so the patient was immediately placed on the antacid treatment—the Sippy diet with alkalies. Under this treatment improvement was noticed almost immediately. The pain was relieved, and in less than a week the hæmoglobin had risen to 65 per cent., the red and white cells remaining about the same. We were congratulating ourselves on the apparent success of the treatment when on the sixth of May, the ninth day after admission, the pain returned and the following day he vomited a large quantity of black clotted blood, making the diagnosis of pyloric ulcer fairly clear. The patient's condition at once became very grave; the pulse could hardly be counted, while his colour became quite ashen. Four hours later a small transfusion of blood (about seven ounces) was given in the hope of arresting the bleeding, but the patient failed to respond, grew weaker and died.

The autopsy report confirming the diagnosis of gastric ulcer is as follows:

"On opening the stomach a large indolent ulcer was exposed on the lesser curvature 4·5 cm. from the pylorus. It was somewhat oval in shape, 3 x 2 c.m. The edges were raised and somewhat rounded. The base was formed by the pancreas near the junction of the head with the body. In the base towards the pyloric margin there was seen a small arterial branch which opened directly into the cavity of the ulcer. This branch was traced directly to the hepatic artery. A marked feature of the case was the indolent appearance, the absence of infiltration, and the extreme localization of the adhesions. The pylorus was intact."

The ulcer was kept as a specimen, and no microscopic section was made.

Note. A single instance of gastric hæmorrhage with such a fatal result, brings up the question of proper treatment of this complication, while a repetition of such an experience within three weeks impresses this matter with more than double emphasis upon the minds of those responsible for the handling of such cases.

The diagnosis in each case was correct—at least as nearly so as possible under the circumstances. The autopsy confirmed the diagnosis. The question as to the duration of the malady and previous hæmorrhages could not be answered. One was dealing with bleeding more or less active in each case. Medical treatment was applied in each case—including opium, horse serum, calcium lactate and blood transfusion—treatment which could avail but little in the presence of such extensive ulceration with a branch of the hepatic artery eroded and patent, as shown by the autopsy in each ulcer. The condition of each patient was not favourable for surgical treatment, yet judged by the blood examination it was not profoundly anæmic. No. 1 presented by far the more serious aspect from the outset, and appeared a very poor "surgical risk" indeed.

The improvement following the treatment in Case 2 was at first most encouraging, yet his failure was rapid and progressively so. The decision in favour of medicinal treatment when surgical aid was invoked was adhered to in the presence of a condition so serious when vomiting of blood supervened, and so both of these patients died of digestive tract hæmorrhages in an hospital under close medical and surgical supervision.

Should every case of severe gastric hæmorrhage be operated on? This question found a positive answer from some connected with the service. If the answer is in the negative, with the qualification that certain cases should be operated on, then follows naturally and insistently—should these cases have been operated upon? The answer may be given from two view-points, since the reports are now complete. The viewpoint reached by the post mortem indicates, we think, that Case No. 2 *might have been* relieved, had surgical treatment been given him when admitted, but the indications were not pressing at that time. The history if available *might* have been helpful. As already pointed out the gravity of the case when vomiting set in was most forbidding.

Case No. 1 showed a condition both general and local, regarded in the light of the autopsy, in which little could be expected from operation. Hæmorrhage might have been checked but the extensive ulceration with the neighbouring structures involved, and the poor general condition would have given the patient a slim chance, indeed, especially if a gastroenterostomy had been attempted at the same time.

FROM THE MEDICAL SERVICE DR. HAMILTON; AND SURGICAL SERVICE, DR. ARMSTRONG

CASE 3.

J. W., age thirty-three, painter, admitted December 10th, 1919, complaining of pain in the abdomen, constipation and colic.

History. From early childhood the patient had been constipated. For *ten years previous to admission* the patient had suffered from a burning sensation in the "stomach", with an occasional colic lasting for a few minutes. With this he had obstinate constipation. For a similar period he had polyuria and nycturia,—symptoms which were intermittent, often leaving him for a month. He had many teeth removed ten years ago.

During the *year prior to admission* there was a noticeable increase in the severity of his symptoms, the "burning" extended over the whole abdomen. The frequency of the colicy pains often rose to six a day; the constipation became more distressing and he began to have pains in the back. Cathartics and enemata were necessary to get a bowel movement, and these combined were often slowly effective. Often three or four enemata were given in a single night.

Physical condition. The patient was pale, and showed evidence of considerable loss of weight. There was slight tenderness on pressure over the right lower quadrant. All teeth were absent save eight lower central ones; some of these show decay and pyorrhœa. There was no blue line on the gums, no wrist drop, nor basophilic stippling of red blood cells. There were dry crackling râles at left apex anteriorly, and posteriorly. They were accentuated after coughing and deep breathing. The blood pressure was 125-70. The knee jerks and pupillary light reflexes were active. Rectal examination was negative.

The report resulting from the opaque meal and the barium enema was in effect a normal stomach, and an abnormal colon and sigmoid—abnormal in size, length and position.

After consultation with Dr. Armstrong an operation for short circuiting was decided upon. The operation was performed on January 10th, 1920, with ether anæsthesia.

Operation. Right rectus incision. After displacing the omentum the following anomalies were noted: "The ileum, about six inches from its distal end was bound into the pelvis by bands of adhesion. Bands connected the mid part of both the ascending

and transverse colon. The cæcum was large and flabby. The hepatic angle of the colon was bound and involved in many adhesions."

The ileum was divided about three inches from the ileocæcal valve, and the transverse colon at about its mid part; the intervening section, roughly fifteen inches in length, was removed and an end-to-end anastomosis was made. The parts denuded of peritoneum were carefully recovered by sutures. The abdomen was closed in layers and drainage tube inserted.

Subsequent course in hospital. Patient made a smooth and perfect recovery. Patient's general condition much improved, and the bowels moved regularly even before going out of the hospital.

On June 2nd, 1920, the patient stated that he returned to work on February 11th, and has felt in fine condition ever since. He has neither abdominal pain nor constipation.

Note. At first sight this patient's history and general appearance suggested chronic plumbism. A careful search for the characteristic signs of lead poisoning, however, failed to discover them. The blue line on the gums, the blood changes, the nervous symptoms were wanting.

It was clear that he was a sufferer from a chronic toxæmia, as indicated by pallor and low nutritition. With this constipation was the outstanding complaint and condition. As already shown above, the cause seemed definitely located in the large bowel, and surgical measures comprising resection and anastomosis were promptly effective in bringing relief.

SERVICE, DR. HAMILTON.

CASE 4. *Carcinoma of the Œesophagus and Raynaud's Disease.*

J. P., male, age fifty-four, compositor, admitted November 18th, 1919, complaining of inability to eat, loss of weight, weakness, pain in finger tips.

History. Negative until present illness.

Present illness. In July, 1919, patient noticed difficulty in swallowing solid food, soon followed by vomiting of all solid food. He has suffered no pain. A loss of nine pounds in weight was reported. Five weeks before admission patient first suffered from numbness and tingling in finger tips of both hands. A week later he noticed that the fingers would become bluish, and then change to white, and then to red, often depending on the temperature. One week before admission he began to suffer pain in the finger

tips, the skin peeled off and beginning dry sloughing of tissue, especially the middle right finger, was noticed.

Physical condition on admission. Patient is under-nourished. The fingers of both hands showed well advanced dry gangrene, with beginning skin and tissue desquamation, while feet were not involved. Severe pyorrhea alveolaris was present. Coarse dry râles over left lung apex anteriorly and posteriorly. Heart normal. Blood pressure 105-80. Red blood cells 4,960,000, white blood cells 6,800, hæmoglobin 85 per cent. Blood Wassermann negative. Afebrile.

Urine was clear, acid, 1013, contained no albumen, no sugar; it was negative microscopically.

Fæces, normal. Benzidine negative.

Fluoroscope. Barium drink was blocked in the œsophagus behind the heart. The lower level of block was irregular. A trace of barium reached the stomach.

Fingers of one hand are blue simultaneously, those of the other hand are white, and are painful, especially the right middle finger where the dry gangrene is most advanced.

On discharge, December 8th, 1919, the patient was comfortable and took liquid nourishment well.

Less than one year from the appearance of symptoms the patient died through inanition—starvation, refusing surgical aid—and without showing any further tissue loss due to Raynaud's disease.

Note. Raynaud's disease is of perennial interest because, no doubt, its ætiology is so obscure. Two remote causes were suggested in this patient's case. Plumbism with a local injury to his finger tips associated with his occupation. The patient explained that owing to new and improved methods of typesetting lead poisoning and finger injuries were now very rare. The appearance of Raynaud's syndrome only after the œsophageal symptoms were well established, and after considerable nutritional changes have taken place, might favour the view of their close relationship—a toxic disturbance with marked malnutrition.

Case Reports

SYNOPSES OF CASE REPORTS FROM THE MONTREAL GENERAL HOSPITAL

FOREIGN BODY (TARTAR) IN THE RIGHT LUNG, WITH ABSCESS OF THE LUNG AND PYOPNEUMOTHORAX

M. B., age twenty-eight years, M. G. H. No. 1255, 1920, housemaid, was admitted to the hospital complaining of pain in the right shoulder, right chest and back, and of cough.

Previous history. Unimportant except that she has had pyorrhœa for several years.

Present illness. She had been in good health until three days before admission, when on returning from the theatre she had a chill followed by high fever and headache. The following day she developed a severe cough with slight expectoration, pain in the back and in the right chest.

Examination on Admission. A very stout woman, face and hands cyanosed. Respirations rapid and jerky with an occasional expiratory grunt. Pulse 120, irregular and weak, temperature 103·3°. There is an icteroid tint to the conjunctivæ. There is an aggravated condition of pyorrhœa with excessive tartar about the teeth. Some of the teeth are missing. The heart is slightly displaced to the left. Heart sounds clear. *Right lung.* There is dulness, bronchial breathing and bronchophony at the base in front. Apex is tympanitic. Posteriorly this lung shows dulness, increased vocal fremitus, blowing breathing and bronchophony throughout. Left lung normal. An *x*-ray of the chest shows a very dense shadow which occupies almost the entire right half of the thorax, obliterating the diaphragm. This shadow is less marked in the upper portion of the thorax. The heart is slightly displaced to the left. Two days after admission the signs of impairment in the right chest had increased and there was a slight coin sound at the apex. The chest was aspirated and a small quantity of blood obtained. This probably came from the lung. The following day the signs and symptoms were more marked, the patient became semi-comatose, the pulse was barely perceptible and there were signs of fluid in the

right chest. The right chest was again tapped and very purulent foul smelling fluid was obtained. Smears from the fluid showed a very rich bacterial flora similar to that found in infection about the teeth.

Diagnosis. Pyopneumothorax probably secondary to an abscess of the lung which had some ætiological relation with the teeth.

Treatment. Under novocaine a portion of a rib was removed and the pleural cavity drained. Before any fluid appeared in the wound malodorous gas escaped which filled the room with its pungency. A large quantity of very foul pus escaped. Rapid search for an abscess of the lung was made but none was found. A drainage tube was inserted. There was slight temporary improvement following the operation but on the following day the patient died suddenly.

Post-mortem examination. The stomach contained a large amount of fresh blood which was secondary to multiple acute ulcers on the lesser curvature of the stomach. There was a well drained empyema cavity in the right thorax; an abscess of the right lung in which there was a small piece of tartar. This cavity connected with an interlobar abscess which in turn connected with the right pleural cavity. There was extensive confluent septic bronchopneumonia of the right lung. The teeth showed abundant tartar about them. There was an open abscess cavity about the retained root of one of the superior bicuspids on the right side. Smears made from this abscess cavity showed organisms similar to those found in the purulent fluid obtained from the right thoracic cavity.

Summary and Remarks. Female, twenty-eight years of age, suddenly becomes ill with the signs and symptoms of pneumonia. Within five days a pyopneumothorax developed, secondary to an abscess in the lung which had formed about a piece of aspirated infected tartar. One should bear in mind the possibility of such a sequence of events when the bacterial flora from an empyema of the thoracic cavity resembles so closely that found in abscess about the roots of teeth.

FREDERICK J. TEES,

Surgeon to the Out-patient Department (Service J. Alex. Hutchison), Montreal General Hospital.

ACUTE PHLEGMONOUS LARYNGITIS, STREPTOCOCCUS SEPTICÆMIA AND SEPTIC PNEUMONIA

MR. X., age fifty-one years, M. G. H. No. 1568, 1920, was brought to the hospital on Sunday, April 4th, complaining of sore throat and difficulty in breathing and swallowing which had been present for four days.

Previous history. He was an inveterate smoker and went on periodic sprees. There was no history of syphilis. An enlarged gland, probably tuberculous, had been removed from his neck twenty years ago.

Condition on admission. Temperature 99°, respirations 30, pulse 130, full and bounding. He was a large man weighing approximately 200 pounds, his face was drawn and anxious, his lips blue, his voice husky and there was considerable dyspnœa and dysphagia and a continuous short shallow cough. Apart from a slight congestion of the fauces and posterior pharyngeal wall, this region was negative. The laryngoscope showed the classical picture of an acute phlegmonous inflammation of the epiglottis and ary-epiglottidean folds. The mucosa presented an angry bluish red appearance and there was diffuse swelling and bulging of the superior surface of the epiglottis which made it impossible to obtain a view of the larynx. Cultures taken from the larynx showed many hæmolytic streptococci.

Treatment. The abscess of the epiglottis and ary-epiglottidean folds was immediately incised and the patient expectorated much foul smelling pus. The dyspnœa was almost immediately relieved. He was put to bed and a purge of calomel given. Ice was applied to the neck and a spray of Dobell's solution with the addition of a few drops of adrenalin and 1 per cent. cocaine was prescribed. He was also given a mixture containing perchloride of iron and glycerine. The same evening dyspnœa recurred and as further incision failed to relieve the obstruction, a tracheotomy was performed under local anæsthesia. Before the trachea was exposed, he suddenly stopped breathing. A thyrotomy and artificial respiration resuscitated him. The trachea was then opened without further difficulty. A special nurse was placed in charge and his local and general condition improved until the following day at noon when his breathing became alarmingly rapid owing to the extension of the infection into the bronchi and lungs. He died suddenly two hours

later. At no time was the tracheotomy tube blocked after its insertion.

At the post mortem besides the phlegmonous condition in the larynx there was extensive bilateral septic broncho-pneumonia. Hæmolytic streptococcii were recovered from the heart's blood.

Remarks. The prognosis of bilateral septic inflammation of the larynx is always grave. In my experience when it is limited to one side and treated early, such cases often recover. The late date at which this patient came to the hospital for treatment with such an acute and virulent infection of the laryngeal structure rendered the outcome doubtful.

R. H. Craig,

Associate Laryngologist, Montreal General Hospital.

ABSCESS IN A PATENT URACHUS IN A CHILD NINE MONTHS OLD

BABY, age nine months, was admitted acutely ill.

Personal history. Normal confinement. Full term healthy child. The umbilical cord separated on the ninth day, but the umbilicus never healed completely. There had never been any fluid discharge from it, but it has always been covered with a thin crust. From the age of seven months the child has cried a great deal when voiding. The urine has contained pus, blood, and albumen.

Examination on Admission. There is a slight crust over the umbilicus but no redness or discharge. The urine shows no albumen blood or casts but pus cells are present. There is marked tenderness of the lower abdomen and a small globular mass is palpable in the mid line just above the symphysis pubis. This mass is about two fingers' width in breadth. On rectal examination a tender mass is felt high up in the pelvis, beneath the anterior abdominal wall. Within the next two days this mass rapidly increased in size and extended from the symphysis to the umbilicus and was fluctuatng.

Diagnosis. Abscess in a patent urachus.

Treatment. An incision was made in the midline, the rectus muscle separated and a large abscess cavity entered. This cavity

was extra-peritoneal and extended from the right side of the pelvis upward over the bladder to the umbilicus. The child made an uneventful recovery and the urine soon became normal and has remained so.

Summary and Remarks. Full term healthy child in whom the umbilicus had never healed completely, developed pain in micturition when seven months' old. This continued for two months when an abscess in a patent urachus developed. There had been pus, blood and albumen in the urine. Operation, recovery.

The probable sequence of events is an infection of the urachus through the umbilicus. This has drained into the bladder and interference with this drainage led to a retention abscess which very rapidly increased in size.

R. E. Powell

Associate Genito-Urinary Surgeon
Montreal General Hospital

Canada has a good record in the care of the tuberculosis ex-service men which devolves on the medical branch of the department of soldiers' civil re-establishment. Statistics recently compiled show that 8,676 ex-service men have been treated in sanitoria maintained by this branch. Of that total, 6,636 had been discharged from these institutions, some as cured and others in quiescent condition.

At the time of the survey there were 2,040 patients undergoing treatment, of whom 158 had had previous treatment and had been readmitted to a sanitorium. This percentage of 7·7 per cent. of readmission is regarded as being exceedingly low, and furnishes satisfactory evidence of the success of the efforts of the medical services in coping with tuberculosis among ex-service men. There are medical representatives in every city, town and village of Canada, to whom men may apply for attention.

Editorial

PANCREATITIS, EXPERIMENTAL AND CLINICAL

IN a paper presented before the recent meeting of the Ontario Medical Association, Dr. Edward Archibald took up briefly certain aspects of the pancreatitis problem, particularly with regard to the ætiology. He reviewed the two or three theories as to causation which at present hold the field, pointing out that in his opinion the majority of cases were due to the entrance of bile, altered in its chemical composition frequently by infection, into the pancreatic duct as a result of a spasm of the common duct sphincter. Mr. Brown, of the chemical department of McGill University, working under Dr. Harding, had begun an investigation at Dr. Archibald's suggestion of the chemical constitution of bile as altered by infection, particularly with regard to the proportions of the colloidal constituent (mucin) and the bile salts. Bile salts were the active agent in causing pancreatic necrosis. Three normal biles and one infected bile had been analyzed, and it was found that the proportion of bile salts in the infected bile had been increased from six to twelve fold over that of the mucin, as compared with nomal bile. This hitherto undescribed alteration would seem to account for the much greater tendency to the occurrence of severe pancreatitis in infective gall bladder conditions. He admitted the possibility of contents of the duodenum, in minute quantities, getting back into the common duct in the way observed by Mr. Bond, that of reversed mucous currents. Carmine granules given by mouth can be found in some cases coming out through a cholecystectomy drain. He pointed out that activation of trypsin might be brought about not only in

this way through enterokinase, but also without enterokinase, namely by damming back of pancreatic juice into the gall bladder and its activation there by the bile or by bacteria. In this latter case it might be considered possible, even probable, that in isolated instances the bile containing this activated pancreatic juice might be forced on the road down into the pancreatic duct, and there, even when the bile was normal, set up a moderate grade of pancreatitis. In two or three instances out of a few examined, he had found trypsin in the gall badder bile.

He reviewed briefly the four chief types of pancreatitis from the clinical standpoint, and emphasized the fact that pathologically the primary lesion was always one of necrosis, and that the cause of death was absorption of split protein products from the dead pancreatic cells.

He called particular attention to a fairly numerous type of case, characterized by acute pain in the epigastrium and right hypochondrium coming on in attacks lasting not more than a few minutes to two or three hours, in which operation failed to reveal any organic cause such as ulcer, stones or adhesions, while in a few palpation of the pancreas suggested, though doubtfully, some slight thickening of that organ. Such cases he felt inclined to regard as being often due to spasm of the common duct sphincter analogous to pylorospasm, and sometimes to a very mild pancreatitis.

PITUITRIN

THE use of pituitrin as a stimulant to uterine contraction during the various stages of parturition, has received much favour of late from many obstetricians. The rapidity and ease with which this drug has often produced the desired result may to some extent appear to justify its use in the mind of the busy practitioner with many obstetrical obligations. Nevertheless, associated with these brilliant results, the dan-

gerous and even disastrous results not infrequently produced by its action must not be overlooked. It is also to be remembered that when obstetrical specialists put their seal of approval upon this easy method of overcoming difficulties, many in the profession may be less guarded in the employment of it than the writers would wish, unless very definite warnings regarding its use are given. The action of pituitrin may be likened to that of a thoroughbred hunter; a wonderful performer at times, but on some occasions extremely vicious and absolutely unable to be controlled. During the past few years, reports of cases ending disastrously following its administration in even moderate doses have been not infrequent; instances of ruptured uteri, of premature separation of normally implanted placentas, of impacted face presentations, of fatal asphyxia, of uterine tetany, and of severe cervical and vaginal laceration, force us to regard this obstetrical assistant as possessed of very dangerous potential powers.

In our experience it appears to be difficult to set any limit to the amount of personal idiosyncrasy to the action of this drug. One fourth of a cubic centimetre at times produces as violent a result in one patient as a full cubic centimetre does in another. An injection of pituitrin directly into the uterine muscle, immediately following the emptying of the womb by Cæsarian section, produces a contraction so strong as to induce blanching, and affords a demonstration of its powerful action. Evidence of this kind should make us very guarded in its employment while the uterus contains its living fœtus. Especially should caution be exercised in case of a primipara with an undilated cervix. After its administration a prolonged and severe contraction is maintained with increasing strain on the soft parts which may give way, while at the same time the fœtal circulation is disastrously interfered with if labour is not terminated within fifteen minutes after the action of the drug sets in. It is therefore always desirable to have the forceps ready for immediate use if the infant life is to be saved.

Our object in calling attention to the dangerous results

which may take place from the employment of this drug, is not to condemn its use altogether, but to advise great caution, and its use only in cases in which no obstacle to rapid delivery exists. While pituitrin may have a definite and therapeutically valuable place in obstetrics, its use must be guarded even more carefully than is that of twilight sleep. It may be employed cautiously in cases of incomplete abortion up to the third month, but in the induction of labour at or near term, and in cases of slow or difficult parturition at full time, its employment with our present knowledge cannot be completely dissociated from much danger to both mother and child.

In a survey prepared by the faculty of medicine of the University of Toronto in connection with the prospective gift of $5,000,000 from the Rockefeller Foundation for Medical Research in Canada, it is shown that Ontario leads with one doctor to 766 of population. British Columbia comes next with one doctor to 905. Nova Scotia is third with one doctor to 908, and Manitoba, fourth, with one doctor to 1,098.

The president of the New York Tuberculosis Association stated recently to the members of the Academy of Medicine that the mortality rate of the disease had decreased from 246 deaths in every 1,000 cases in 1909, to 123 deaths in every 1,000 cases in 1919, in New York city.

Obituary

Dr. John Christopher Mitchell, superintendent of the Ontario Hospital for the past ten years, died May 2nd, following an illness of short duration, aged seventy years. Dr. Mitchell graduated from Trinity College in 1875. He practised in Inniskillen, and was associate professor of mental diseases at the Toronto University. He ran as a liberal candidate in Durham fifteen years ago.

James Clemens McAlister, M.D., died at his home in Hamilton, on April 30th, at the age of fifty-nine.

Charles O'Reilly, M.D., C.M., died at his residence in Toronto on May 3rd. He was in his seventy-fourth year.

Dr. Peter McLaren died at his home in Ormstown, Quebec, on May 14th. He was in his seventy-ninth year. He graduated from McGill University in 1872, and had resided in Ormstown for forty-eight years.

Dr. James Anderson, of Hamilton, Ontario, died at St. Mary's Hospital, Rochester, Minnesota, on May 7th, where he had undergone an operation for cancer of the throat.

Joseph Walker Cull, M.D., died at Mitchell, Ontario, May 17th, 1920. He was in his eighty-second year.

Dr. Omar L. Kilborn, died at Toronto, May 18th, 1920.

Miscellany

News

ONTARIO

The Civil Service Commission anounces the appointment of Dr. Helen MacMurchy to take active charge of the division of child welfare in the Federal Department of Health in Ottawa.

QUEEN'S Medical College is enlarging its permanent staff by the addition of six professors. The necessary clinical facilities will by provided by the enlarging and improving of the General Hospital, for which the Ontario Government is giving $80,000 a year for five years.

THE opium and drug bill that was recently amended in the House of Commons is aimed to establish a greater measure of control over the traffic in Canada of opium, morphine, heroin and cocaine. In 1908 the first Canadian campaign so reduced the import of these drugs into Canada that in 1910 they dropped in the two years from 81,000 pounds annually to 6,418 pounds. In 1917 these imports doubled the previous year, and continued to mount until in 1919 the figures for the ten months ending March 31st, stood at 37,210 pounds. The department of health was then formed and took over active administration of the law. The succeeding ten months saw a decrease in imports to 7,995 pounds. However, in the three years up to 1919, about 85,000 pounds has been imported, as against an estimate of 1900 in the three years ending March, 1915.

MAJOR-GENERAL J. T. FOTHERINGHAM, C.M.G., M.D., LL.D., has resumed his practice at 20 Wellesley Street, Toronto, as consultant physician after four years of strenuous and most valuable service both overseas and for the past two years as Director-General of the Canadian Medical Services in Ottawa.

QUEBEC

THE report of the annual meeting of the Quebec Provincial Branch of the Red Cross Society shows that, notwithstanding the close of the war, the work has been carried on during the past year throughout the province by fifty-three local branches and their groups, and by sixty-five Red Cross groups and auxiliary societies connected directly with provincial headquarters, as well as by two hundred and ten groups in Montreal. Activities were not relaxed at ports and stations and great energies were maintained in equipping the hospitals and the Red Cross Lodge. The total receipts for the year amounted to $983,499.81; total disbursements, $974,865.47; administration $3,607.26. A5tention was called to the fact that this year, as previously, the administration expenses were more than covered by bank interest.

NEW BRUNSWICK

THE Bureau of Health at St. John plans the establishment of ten venereal clinics throughout the province. These clinics will be in charge of physicians who have had special training in the diagnosis and treatment of these diseases, and will make possible free advice and treatment for those unable to go to the larger centres for attention. The places selected for the clinics are be: St. John, Moncton, Chatham, Bathurst, Campbellton, Edmundston, Grand Falls, Woodstock, Fredericton and St. Stephen. An educational campaign to instruct the public along combative lines will also be carried out.

NOVA SCOTIA

THE Nova Scotia branch of the Provincial Red Cross has appointed Colonel F. V. Woodbury, of the Canadian Army Medical Service, to organize two travelling clinics to go throughout the province during the months of July and August. These clinics, organized on a semi-military basis, will carry trained specialists, operating room outfit, dental service and a nursing corps to assist the doctors in their operative procedure. The plan even contemplates carrying with these travelling clinics, facilities for impressing sanitary lessons by educational moving picture films, and when this is not feasible in some communities, graphic lessons by projecting lanterns willl be supplemented with lectures.

DR. D. A. CRAIG has accepted an important post at Halifax as medical consultant on the staff of the Massachusetts Halifax Health Commission. Dr. Craig is vice-president and former secretary of the West Ontario Academy of Medicine, which he was instrumental in organizing. His services during the war as consulting physician in tuberculosis for the C.A.M.C. of military district No. 1 merited official commendation.

SASKATCHEWAN

THE newly organized Western Association of Hospitals, formed at the Calgary conference, exists for the purpose of forwarding the movement for greater co-operation among the hospitals of the four western provinces for the promotion of standardization among hospitals, and greater efficiency among the staffs. Dr. M. Seymour, of Regina, has been elected president, and Dr. Warren, of

Calgary, secretary. There will be four vice-presidents for the four provinces.

THE peril of tuberculosis in Saskatchewan, in comparison with other communicable diseases, is shown in a chart prepared by the provincial commission of public health. The chart shows the number of lives lost from tuberculosis during the five year period from 1914 to 1918, as compared with four other communicable diseases causing the greatest mortality in the province. Spanish influenza is excluded. The average death rate for tuberculosis was 45 per 100,000 of population as compared with 6·2 from measles, 8·2 for whooping cough, 8·2 for diphtheria, and 8·8 for typhoid. The diagram also shows the very steady increase from year to year in tuberculosis mortality. In 1914 the death rate was 35·2 per 100,000; 1915, 38·2; 1916, 44·6; 1917, 47·4, and 1918, 54·5, making the average for the period, 45.

BRITISH COLUMBIA

THE University of British Columbia has received an offer from the Provincial Red Cross Society for a Red Cross Chair of Public Health. Should the offer be accepted by the Senate and Board of Governors of the university, the Red Cross will undertake to pay the salary of a professor of public health for a period of three years. The university will undertake the incidental, secretarial and laboratory expenses in connection with the chair. The activities of the chair will be province-wide in scope and the course will extend over five years.

THE British Columbia Medical Act requires each year the election of representatives for various medical electoral districts throughout the province. Practitioners elect doctors to represent the college in five districts, and the College of Physicians and Surgeons f British Columbia announce the results as follows: Victoria district, Drs. R. L. Fraser and George W. Hall; New Westminster, district 2, Dr. R. E. Walker; Vancouver, district 3, Drs. E. D. Carder and V. E. D. Cassellman; Kamloops, district 4, Dr. J. S. Burris; Fernie, district 5, Dr. Saul Bonnell.

Book Reviews

PULMONARY TUBERCULOSIS. By MAURICE FISHBERG, M.D., clinical professor of medicine, New York University and Bellevue Hospital Medical College. Second edition, revised and enlarged. 744 pages, with illustrations. Publishers: Lea & Febiger, 706 Sansom Street, Philadelphia, 1919.

The purpose of this book, as indicated by the author in the preface, is "to supply the general practitioner with information concerning the ætiology, diagnosis, prognosis, and treatment of pulmonary tuberculosis, its clinical forms and common complications". How well the author has succeeded in carrying out his purpose is apparent to any one familiar with the subject who takes time to peruse these pages. The divisions are made into chapters of which several are quite new, e.g., that on tuberculosis of the pleura and others, including a comprehensive discussion of the differential diagnosis of tuberculosis. The author included in them new data arising from army statistics, and experience with the recent widespread influenza epidemic, as well as data from many other sources. Emphasis is laid upon child infection, and in the discussion of the diagnosis of tuberculosis Dr. Fishberg is most careful to point out the importance of a diligent, painstaking search for evidences of toxæmia, for without these the patient cannot be regarded as having active disease. The treatment of tuberculosis is satisfactorily dealt with, home and sanitorium methods being clearly discussed and evaluated. The author does not fail to enumerate the most modern methods including that of artificial pneumothorax. Dr. Fishberg's new edition, even more than its predecessor, should find its place in the library of every general practitioner. W. F. H.

NERVOUS AND MENTAL DISEASES. By ARCHIBALD CHURCH, M.D., professor of nervous and mental diseases, Northwestern Medical School, Chicago; and FREDERICK PETERSON, M.D., formerly professor of psychiatry, Columbia University. Nineth edition. 949 pages with 350 illustrations. Price, $7.50. Publishers: W. B. Saunders Company, Philadelphia and London, 1919.

This book is the ninth edition of what has proved to be a stand-

ard text-book for students and practititioners so that a detailed review of it is superfluous. This edition differs little from the preceding one except that, as the authors say, the subjects of general paresis and traumatic insanity have been rewritten. In the section on nervous diseases there perhaps might have been more careful revision as one notices that the definition between Tic and Spasm is not clearly differentiated, and that the treatment of trigeminal neuralgia is perhaps not quite modern.

The chapter, however, on arterial brain diseases, tumours of the brain, spinal cord lesions and epilepsy are excellent. The section on mental diseases is, on the whole, excellent. However, enough attention has not been given to manaic depressive insanity, dementia præcox and general paresis. On the other hand, too much attention has been given to the physical standpoint of mental diseases.

From a general view point this book still remains an excellent one for students and practitioners. G. S. M.

CHEMISTRY FOR PUBLIC HEALTH STUDENTS. By E. GABRIEL JONES, M.Sc., F.I.C., lecturer in public health chemistry in the University of Liverpool. Publishers: Methuen & Co., Ltd., 36 Essex Street, London, W.C., 1920.

In this text-book the author presents the more important branches of his subject in some detail, while the less important features are covered in a somewhat sketchy manner. A well chosen list of reference volumes, however, is provided for those who wish more complete information on special points. The author first gives a short review of the various methods of analysis, and then goes on to the analysis of foods. He deals with their usual composition, the common forms of adulteration, and the means of detecting these adulterants. There are frequent references to Government reports, and to the various Acts controlling the food supply in England There is also an excellent section on "Metallic Poisons in Food". The chapter on water analysis is particularly full. The author describes the various methods of examination and discusses the important and characteristic features of safe and polluted water supplies, and lays special emphasis on the importance of a bacteriological examination in all doubtful cases. Air analysis is also covered in a comprehensive manner, and there is a special chapter dealing with the disinfectants.

The subject matter is well arranged and the book is a very readable one, in spite of its condensed form. One drawback is the

absence of diagrams and illustrations, the presence of which would have simplified the description of some of the more complicated pieces of apparatus. D. S. L

CHILD WELFARE AND THE TEACHINGS OF CERTAIN DENTISTS, SCHOOL MEDICAL OFFICERS, MEDICAL OFFICERS OF HEALTH AND OTHER MEDICAL MEN. By J. SIM WALLACE, D.Sc., M.D., L.D.S., formerly dental surgeon and lecturer on dental surgery, London Hospital. Price, 5/- net. Publishers: Baillière, Tindall & Cox, 8 Henrietta Street, Covent Garden, London, W.C. 2, 1919.

The author of this small book of one hundred pages is both a graduate of medicine and dental surgery. The book is in reality a collection of five papers or addresses delivered before different societies during the last six years. The style is simple and non-technical and the book is written in the emphatic and dogmatic way which is so common to many writings concerning child welfare.

The general impression given by the book is that the dental surgeons do not consider that their views receive sufficiently serious attention from the physiologists and physicians of England.

Dr. Wallace considers the dentist as more than a cleaner and mender of teeth, and is anxious to have the dental surgeon accepted as one of the specialists of medicine.

Under prophylaxis at different ages a right amount of stress is laid upon diet, but as a dietitian Dr. Wallace is not altogether a success: *e.g.*, on page fourteen he recommends that a child of seventeen months be fed partly on half milk and half water with a little sugar of milk added, whereas all pediatricians are agreed that the average child should be on whole milk at that age.

The chief value of this book is due to the emphasis and lucidity with which the author points out the important role of prophylaxis in dental surgery. H. P. W.

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